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Marine Review

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The National Publication Covering the Business of Transportation by Water

November, 1927

Golden Gate Repeats with Ingersoll-Rand Marine Engines

FOLLOWING the successful performance of the three Diesel-electric ferries "Golden Bear," "Golden Shore," and "Golden Poppy," the Golden Gate Ferry Company has placed a REPEAT ORDER for a fourth boat of identical specifications.

Like its three sister ships, the new boat will use Ingersoll-Rand Marine Oil Engines of 400 b. hp., each being direct-connected to a generator and an exciter.

INGERSOLL-RAND COMPANY
11 BROADWAY NEW YORK CITY
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Ingersoll-Rand

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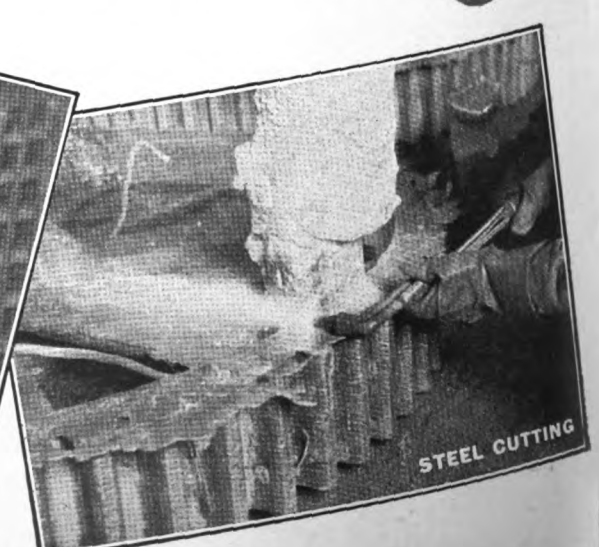
Acetylene—
the universal gas



OCCASIONALLY one hears of a gas other than acetylene that can be used with oxygen for cutting steel.

The promoters of such gases readily admit that acetylene is the best for all other uses with oxygen.

That's why acetylene can be called the universal gas for all oxy-acetylene welding and cutting. It can be used equally well for welding thick or thin plates of metal. It is the most satisfactory for cutting steel or cast iron, and also for brazing, welding and soldering.

In fact, the very term—*oxy-acetylene* process—itself is a good indication of the fact that acetylene is the "universal" gas.

The Prest-O-Lite Company has 31 plants in operation and 101 distributing points for supplying users of this universal gas.

THE PREST-O-LITE COMPANY, INC.
Un of Union Carbide and Carbon Corporation

UCC

General Offices: Carbide and Carbon Building
30 East 42d St., New York
31 Plants—101 Warehouses

Prest-O-Lite

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Marine Review

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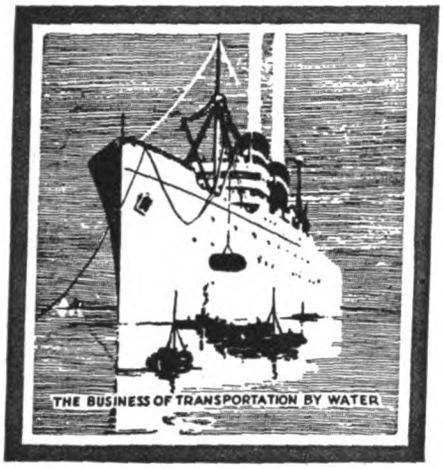

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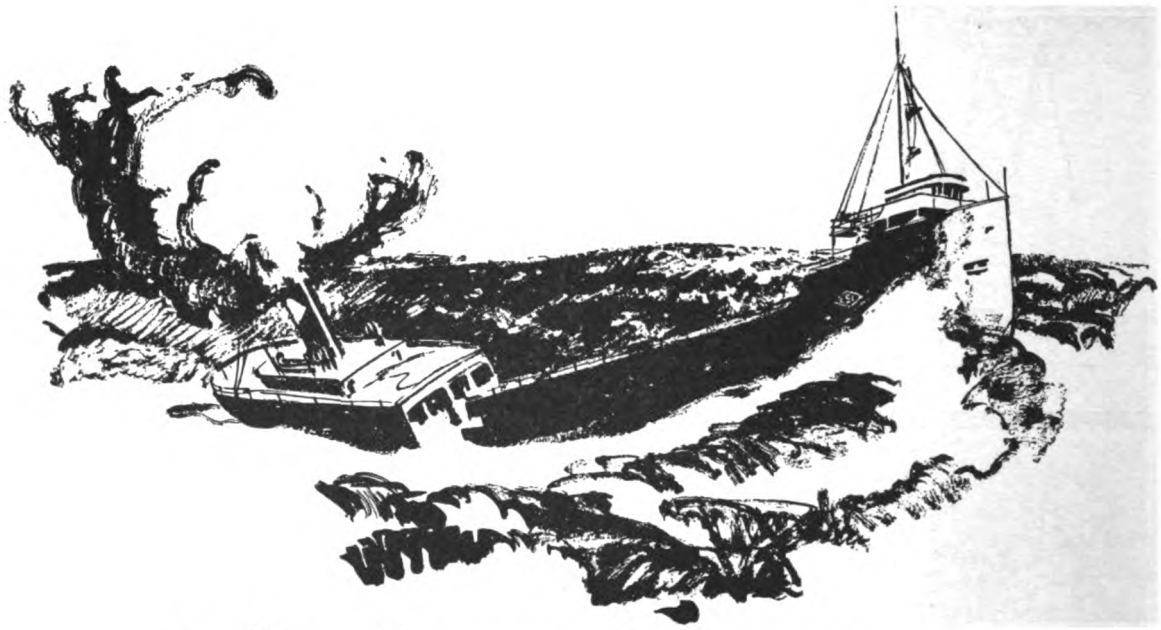
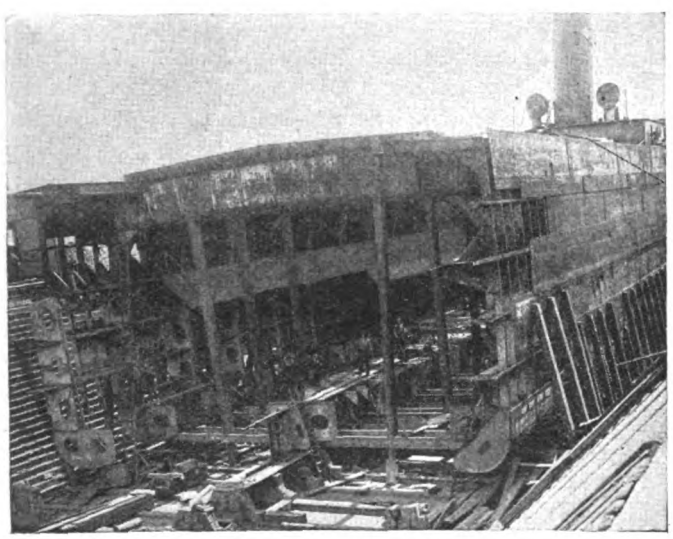


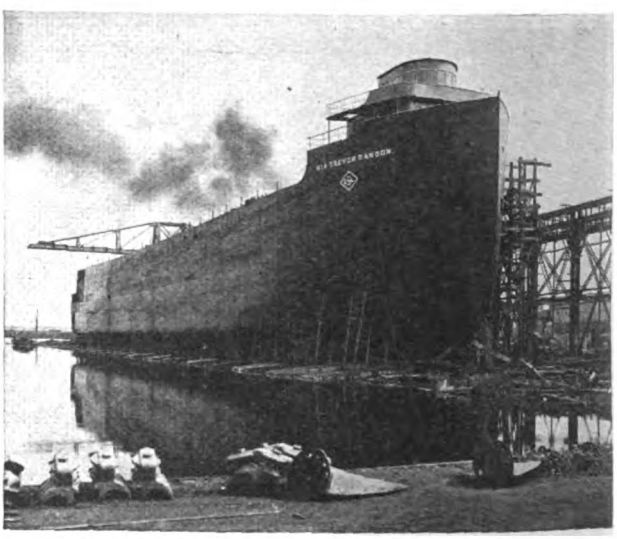
Sunk on Superior

When the Steamer W. C. Moreland broke in two on Eagle Point, The American Ship Building Company was naturally called on for this big repair job.



The After End Rebuilt

Eventually the after end was raised, floated to our Superior dry dock, and thoroughly rebuilt by the men who build ships and therefore know how to repair them.



A New Forward End

We had the plans and patterns of the Moreland, as we have of most Lake Ships. It was comparatively easy for us, therefore, to build a new forward end on our Superior ways.

The AMERICAN

CLEVELAND
American Ship Building Co.

LORAIN
American Ship Building Co.

DETROIT
Detroit Ship Building Co.

BUFFALO
Buffalo Dry Dock Company

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Marine Diesel Engine

Insert section of the

November 1927 Issue

Marine Review

New York London Cleveland

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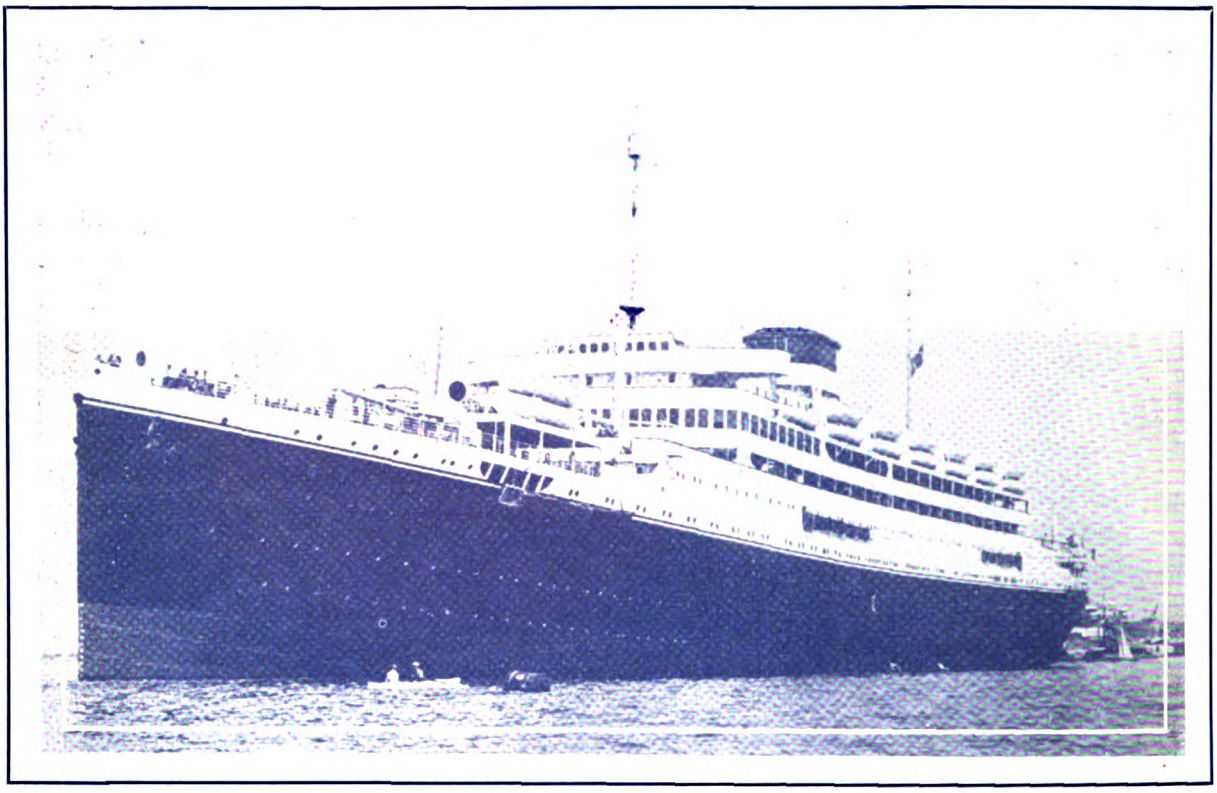

Largest and Fastest Motorship in the World—Twin Screw Passenger Motor Liner Saturnia

We Need Diesel Engined Vessels to Meet Foreign Operating Costs

IT IS a safe bet that it is pretty hard to find nowadays even an American ship owner who does not believe in the superior fuel economy of the diesel engine. If such there be he is not keeping up with the times in the technical development of marine propulsion. A good percentage of the skilled engineering brains of the world and many ship and engine building yards are engaged in extensive labor along the wrong lines if such an odd operator were right. It is only necessary to point out what the world outside of America is doing in producing diesel ships to convince even the most obstinate that there must be something to the internal combustion engine.

British Lloyd's, with its eye on shipbuilding in every quarter of the globe, in a statement dated Oct. 12, shows that motor vessel construction throughout the world gained about 130,000 gross tons between June 30, and Sept. 30, of the present year. And this further startling fact, that over 700,000 tons more of vessels equipped with internal combustion engines are now in hand than there were a year ago. The total motor vessel construction for the world as of Sept. 30, 1927 was 1,589,510 gross tons. Compare this figure with 1,485,000 gross tons for all other types of vessels combined, under construction in the world as of the same date and one will be convinced that the world outside of America at least is serious about this business of providing economical diesel drive ships. One is also apt to do some serious thinking of what the future holds in store on the high seas for an American merchant fleet still very largely equipped with machinery of a design prevailing ten to fifteen years ago and with machinery for the most part built in a great hurry under wartime conditions of labor and material.

The picture is somewhat relieved by the fact that the government through the agency of the shipping board has taken some initial steps to remedy this situation. Every American shipping man knows of the diesel conversion pro-

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gram of the shipping board. He knows that it was started in the fall of 1924 with the object give our engine builders a chance to become familiar with the diesel engine. This program subjected to many annoying delays is largely consummated. Eleven modern cargo vessels of about 9000 tons deadweight each and 11 to 11½ knots speed will have been placed in condition by the end of 1927. The remaining and twelfth vessel it is expected will be completed early in 1928. Of these twelve vessels, four have received the latest type of double acting engines. The remaining eight are fitted with single acting engines. Five engine builders of high standing have participated in this work to the extent of supplying one, two and four engines.

Sufficient time having passed to demonstrate the economic superiority of these vessels in actual service the shipping board on Sept. 19, last ordered that contracts be awarded on bids received for eight additional diesel engines, two to each of four of the five engine builders who shared in the first program. On the completion of these additional vessels the United States will possess a merchant fleet of twenty recent diesel vessels of a good long voyage type, exceptionally fine vessels in every respect as to cargo handling equipment, machinery and navigating equipment. These ships will compare favorably with the very finest built abroad in every particular except that of speed. They are too slow for the modern trend even in the matter of moving freight. Another two to two and one-half knots (which was impracticable with the hulls being what they were) would have made them the premier cargo ships in the world.

In an attempt to correct the serious drawback of speed to place these new diesel ships in first rank, the shipping board has for the past year made serious efforts to find the proper solution. That such a solution has been found in the order which recently went forth from the board for the conversion of the three freighters, COURAGEOUS, TRIUMPH and DEFIANCE is still subject to heated differences of opinion among experts and near experts and others who can lay no claim to technical judgment. The fact remains that the shipping board wisely deferred the question of technical judgment to the leading exponent of the science of naval architecture in this country, if not in the world. We refer to Rear Admiral D. W. Taylor, U. S. N. retired, for nearly ten years chief constructor of the navy. The responsibility for the technical features of the conversion to diesel electric of these three freighters it seems is very definitely fixed and properly placed. We hope, and we have faith, that this much discussed conversion will prove to be all that its sponsors claim for it,

(Continued on Page 80)

Twenty-two Diesel Ships

IN CONSIDERING the merits of diesel engine motive power for any vessel, it ought to be useful to review such recent installations as have been made. For this purpose certain definite information is given in the following pages for twenty-two different makes of diesel engines and the vessels in which they have been or are being installed. The information given is authoritative as it was received directly from each engine builder.

Though it is apparent that the United States is behind other nations in the application of the diesel engine, it is evident that interest is steadily growing in the possibilities of diesel and diesel electric propulsion.

Diesel Ships—Where to Find Them

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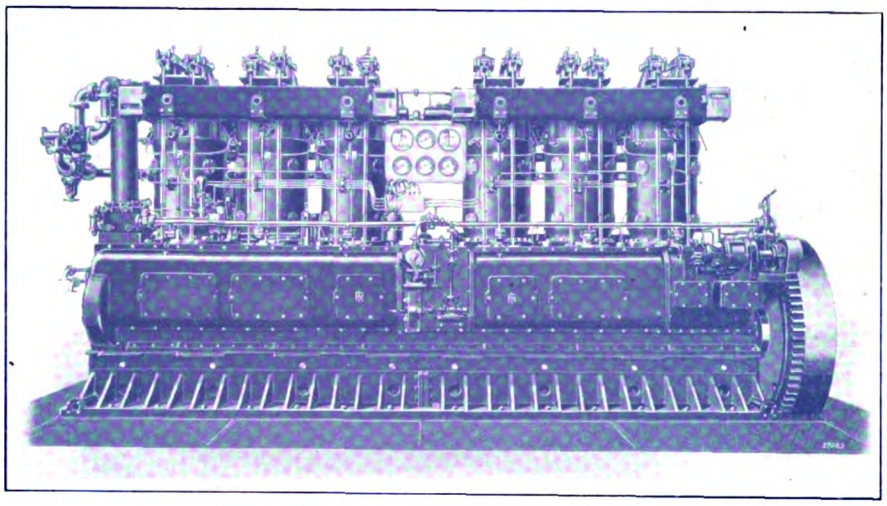
Diesel Electric Drive in Tanker Point Breeze

Three Engines—Each 650 B. H. P.



DESCRIPTION

Three engines of this size and type each direct connected to a generator were installed in the tanker POINT BREEZE. The engine is of the single acting, trunk piston, solid injection type and operates on the four stroke cycle. Ignition is by heat of compression only. No external heating elements are required.

Engine

Name of Engine—Ingersoll-Rand; **Year**—1927
Builder—Ingersoll-Rand Co.; **Type**—PR
Cycle—4; **No. of Cylinders**—6; **B. H. P.**—650
Action—Single acting; **Injection**—Solid direct
Piston Coolg.—No; **Bore**—17¾ in.; **Stroke**—22 in.
R. P. M.—240; **Piston Speed**—825 feet per min.
B. H. P. per Cyl.—108; **Stroke to Bore**—1.24
Working Strokes per Revolution—Three
Weight—One engine, 129,000 lbs.; 198 lbs. per h. p.
Reversing—Engine non-reversing; electric drive
Air Compressors—For starting; Auxiliaries only

Vessel

Name—Point Breeze; Converted to diesel electric
Type—Single screw ocean going oil tanker
Main Drive—Diesel-electric (motor driving prop.)
Length B. P. P.—365 ft.; **Length O. A.**—380 ft.
Beam—50 ft. 9 in.; **Depth Molded**—29 ft. 5 in.
Draft—20 ft.; **Ddwght.**—7057 tons; **Speed**—9 kts.
No. of Propellers—One; **Fuel Cap.**—Abt. 7700 bbls.
Fuel Consumption—Lbs. per b. h. p. per hr.—0.407
Generators—Three of 525 kilowatts with 50 kilowatt exciters attached; r. p. m. 225; 250 volts. Each generator is driven by one oil engine of size and type shown and described.

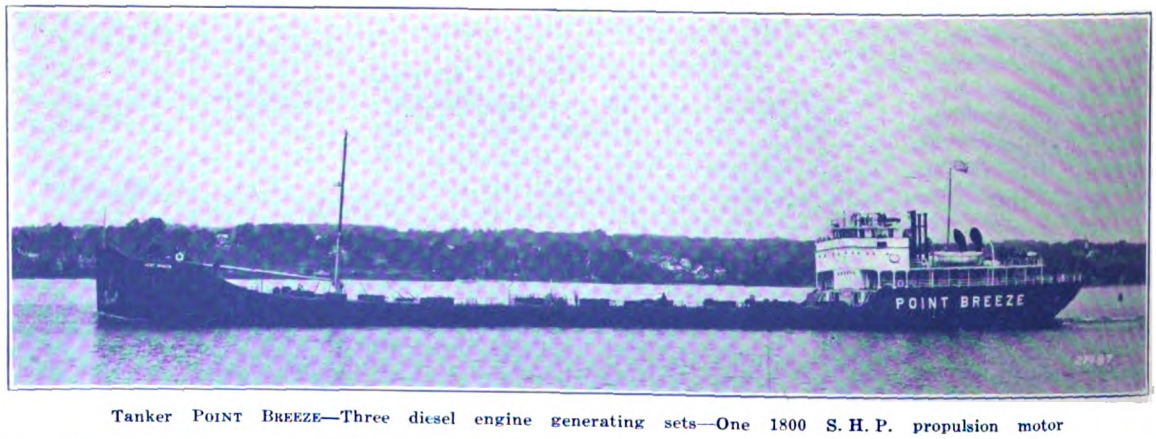
Electric Propulsion Motor—One, double armature 1800 s. h. p. at 90 r. p. m. 750 volts. This motor and the three attached generators were furnished by the General Electric Co.

Remarks

The Atlantic Refining Co. first inaugurated diesel electric drive in the ocean going tanker, J. W. VAN DYKE. Since this initial installation the company acquired from the shipping board three steam tankers each of about 7000 deadweight tons, the J. M. CONNALLY, SHARON and BESSEMER, with the definite understanding that they were to be converted to diesel electric drive.

The POINT BREEZE, ex J. M. CONNALLY, the first of the three new diesel electric tankers, the conversion work on which was carried out by the Atlantic Refining Co. at its Point Breeze plant, was placed in operation late in July. The capacity after conversion was increased 5000 barrels so that her present capacity is 60,000 barrels.

In addition to good fuel economy the advantages claimed for diesel electric drive in the POINT BREEZE is greater maneuvering qualities, pilot house control, guarantee against shutdown.



Tanker POINT BREEZE—Three diesel engine generating sets—One 1800 S. H. P. propulsion motor

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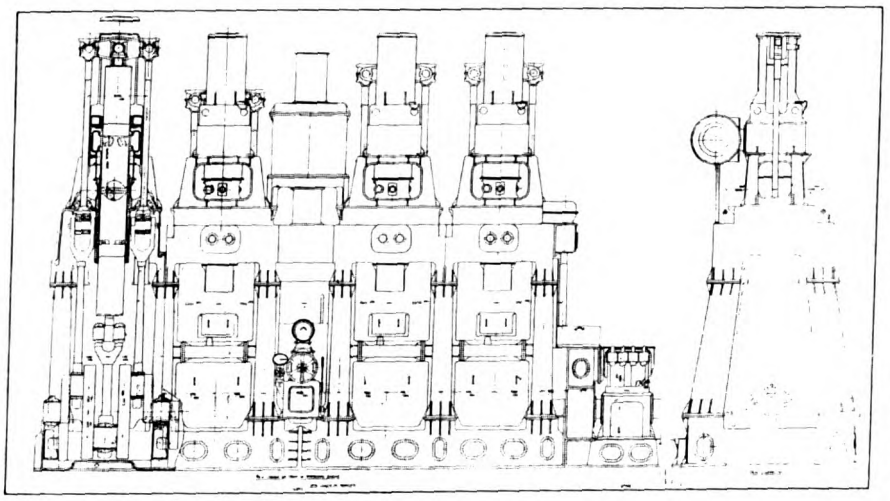
Twin Diesel Direct Drive in Tanker Hull 107

Two Engines—Each 2100 B. H. P.



DESCRIPTION

Two engines of this size and type direct connected to separate propeller shaft are to be installed in a 16,850 deadweight ton tanker now building. The engines are of 4-cylinder, 2-cycle, solid injection, Sun-Doxford opposed piston type, operating under low compression (285 lbs.) Scavenger pump is attached to main crankshaft and is located between the third and fourth cylinders.

Engine

Name of Engine—Sun-Doxford; **Year**—1927
Builder—Sun Shipbuilding & Dry Dock Co.
Cycle—2; **No. of Cylinders**—4; **I. H. P.**—2390
B. H. P.—2100; **Action**—Single; **Injection**—Solid
Scavenging—Attach.; **Piston Coolg.**—Fresh water
Bore—21.26 in.; **Stroke**—85 in.; **R. P. M.**—82
Piston Speed—583 ft. p. m.; **Press. Ind.**—95.6
Pressure Brake—84.2; **B. H. P. per Cyl.**—525
I. H. P. per Cyl.—597; **Mechanical Eff.**—88%
Stroke to Bore—4; **Wkg. Strokes per Rev.**—4
Length O. A.—52 ft. (over thrust shaft flange)
Height—29 ft. 8 in.; **Width O. A.**—11 ft. 10 in.
Weight—One engine, 580,000 lbs.; All machinery, 1100 tons; Lbs. per B. H. P. one engine, 276; Lbs. per B. H. P. all machinery, 586
Reversing—Yes; **Air Comp.**—Two of 150 c. f. m.

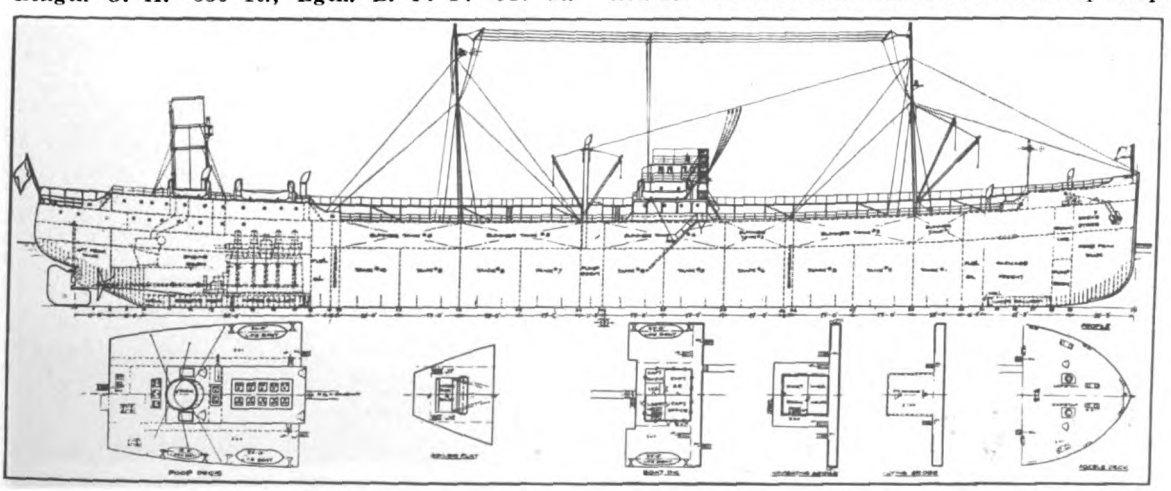
Vessel

Name—Hull 107; **Builder**—Sun S. B. & D. D. Co.
Type—Twin screw ocean going oil tanker
Main Drive—Two diesel engines direct connected
Length O. A.—530 ft.; **Lgth. B. P. P.**—510 ft.
Beam—70 ft.; **Depth**—40 ft.; **Draft**—29 ft. 6 in.
Displ.—24,000 tons; **Deadweight**—16,850 tons
Speed—11½ knots; **No. of Screws**—2
Fuel Capacity—10,500 bbls., 1500 tons
Fuel Consumption—Lbs. per b. h. p. per hr., all purposes—0.45; Lbs. per i. h. p. per hr., all purposes—0.392; Tons per day—20.3; Sailing radius—20,000 miles
Generators—Two of 120 k. w. each at 325 r. p. m.; Westinghouse, direct driven by Worthington 180 h. p. diesels

Remarks

This large twin screw diesel tanker is now under construction by the Sun Shipbuilding & Dry Dock Co. and will be launched about February next.

All auxiliaries in engine room, and the steering gear, are electrically driven. All of the deck machinery and the cargo pumping system will be steam driven. This vessel is under construction for the California Petroleum Steamship Corp.



Twin screw diesel tanker—Main drive two 2100 H. P. each, Sun Doxford engines

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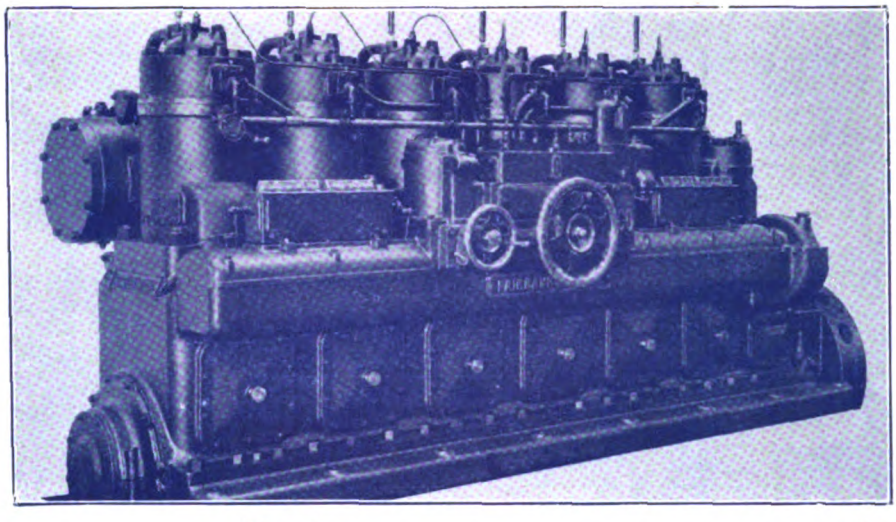
Diesel Direct Drive in Tanker Colonial Beacon

Two Engines—360 B. H. P.



DESCRIPTION

Two engines of this size and type direct connected to separate propeller shafts were installed in the oil tanker COLONIAL BEACON, owned and operated by the Beacon Oil Co., Boston. The engine is of the two-cycle, airless injection type with port scavenging and trunk pistons. Simplicity and ruggedness are features of the design. The operating controls are centralized.

Engine

Name of Engine—Fairbanks Morse; **Year**—1927

Builder—Fairbanks, Morse & Co.; **Cycle**—Two

No. of Cylinders—6; **B. H. P.**—360; **Action**—Single

Injection—Airless; **Scavenging**—Port, crankcase for engines 360 horsepower and below. Scavenging pump for engines 560 to 840 brake horsepower

Piston Cooling—No. Only in 560 b. h. p. and larger

R. P. M.—250; **B. H. P. per Cylinder**—60

Wkg. Strokes per Rev.—6; **Lgth. O. A.**—18 ft. 4 in.

Height O. A.—7 ft. 5 in.; **Width Overall**—7 ft. 1 in.

Weight—Including flywheel, 53,450 pounds

Reversing—Direct; **Air Compressor**—Built in

Vessel

Name—Colonial Beacon; **Type**—Oil tanker

Main Drive—Two diesel engines direct connected

Length B. H. P.—253 ft. 6 in.; **Beam**—40 ft. 0 in.

Depth—15 ft. 0 in.; **Draft**—12 ft. 0 in.

No. of Propellers—Two

Fuel Consumption—Lbs. per b. h. p. per hr.—0.46

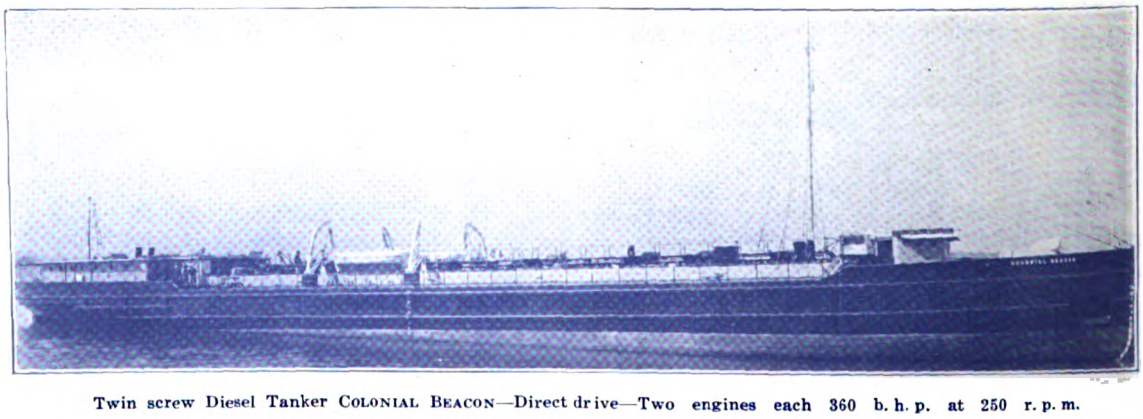
Generators—Two of 50 k. w. each; One of 18 k. w. All three driven by Fairbanks, Morse diesels

The tanker COLONIAL BEACON was built to clear barge canal bridges and locks. She carries gasoline and light oils from refineries at tidewater along the coast to inland distributing points. The vessel was built by the Sun Shipbuilding & Dry Dock Co. for the Beacon Oil Co., Boston.

Some of the Standard Sizes of Engines Built

B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A. feet	L. O. A. inches	Height feet	Height inches	Width feet	Width inches	Weight
150	400	2	6	10	8	5	3	4	5¾	12,870
120	360	2	4	9	11¾	5	6¼	5	1	14,900
180	360	2	6	13	0	5	6¼	5	1	21,050
240	250	2	4	14	6½	7	5	7	1	38,300
360	250	2	6	18	7	7	5	7	1	53,450
560	250	2	4	18	2¼	10	0	8	0	72,800
700	250	2	5	20	8¼	10	0	8	0	83,260
840	250	2	6	23	2¼	10	0	8	0	95,420

Also from 25 to 100 b. h. p. engines and diesel generator sets from 20 to 120 k. w.



Twin screw Diesel Tanker COLONIAL BEACON—Direct drive—Two engines each 360 b. h. p. at 250 r. p. m.

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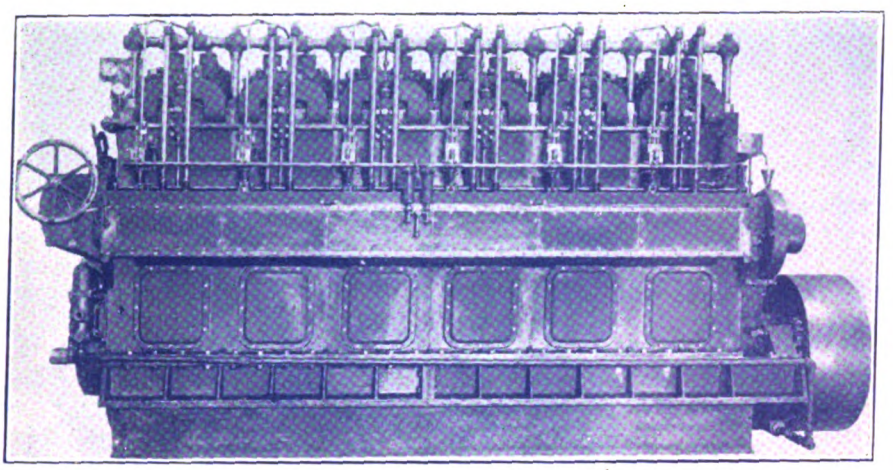
Diesel Electric Drive in Ferry Fresno

Four Engines—Each 450 B. H. P.



DESCRIPTION

Four engines of this size and type each direct connected to a generator supplying current to a double armature motor direct connected to a propeller at each end are installed in the ferry, FRESNO and five sister ferries. The engine is of the mechanical injection type, vertical in construction with six single acting working cylinders

Engine

Name of Engine—Nelseco 6-MI-22; **Year**—1927
Builder—The New London Ship & Engine Co.
Cycle—4; **No. of Cylinders**—6; **I. H. P.**—576
B. H. P.—450; **Action**—Single; **Injection**—Solid
Piston Cooling—No; **Bore**—15 in.; **Stroke**—22 in.
R. P. M.—230; **Piston Speed**—842 feet per minute
Pressure Indicated—85.2; **Pressure Brake**—66.4
B. H. P. per Cyl.—75; **I. H. P. per Cyl.**—96
Mechanical Efficiency—78%; **Stroke to Bore**—1.47
Wkg. Strokes per Rev.—3; **Lgth. O. A.**—18 ft. 2 in.
Height Overall—8 ft. 4½ in. above shaft
Width Overall—4 ft. 8 in.
Weight—One engine, 75,800 lbs. incl. flywheel
Reversing—Non-reversing; **Air Comp.**—Non-fitted

Vessel

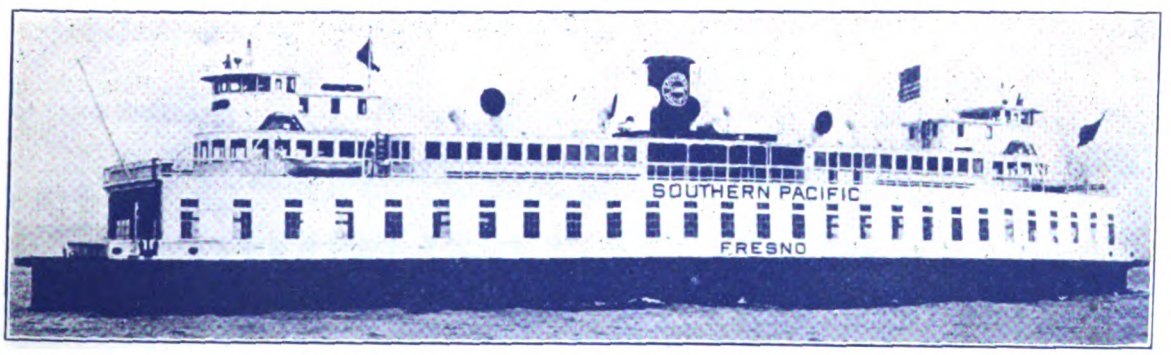
Name—Fresno. Sister vessels are Stockton, Lake Tahoe, Santa Rosa, Mendocino, Redwood Empire
Type—Passenger and automobile ferry boat
Main Drive—Diesel electric. Four generating sets
Length B. P. P.—234 ft.; **Beam**—44 ft. 10 in.
Depth—19 ft. 9 in.; **Propellers**—Two (each end)
Speed—12½ knots; **Fuel Consumption**—Lbs. per b. h. p. per hr.—0.42
Generators—Four of 275 kilowatts each at 230 r. p. m. of General Electric and Westinghouse make; each generator driven by a diesel engine of size and type illustrated and described above
Motor—One double armature motor at each end, 1250 s. h. p. at 100 to 130 r. p. m.

REMARKS

Three of these ferries, the FRESNO, STOCKTON and LAKE TAHOE, are owned by the Southern Pacific Railroad Co., and the remaining three, SANTA ROSA, MENDOCINO and REDWOOD EMPIRE, are owned and operated by the Northwestern Pacific Railroad Co. These ferries carry passengers and automobiles, and the first three run between Market street, San Francisco, and Oakland, while the three latter operate from Market street to Sausalito. All six of these ferries are now in operation and are in service 24 hours per day.

Some of the Standard Sizes of Engines Built

I.H.P.	B.H.P.	R.P.M.	Cycles	No.Cyls.	Length O. A.	Height	Width	Weight
500/594	400/475	260/280	4	8	18 ft.-1 in.	6 ft.-9½ in.	3 ft.-11½ in.	46,650
375/462	300/370	220/250	4	4	14 ft.-2 in.	8 ft.-4½ in.	4 ft.-8 in.	46,200
470/575	375/460	220/250	4	5	16 ft.-6 in.	8 ft.-4½ in.	4 ft.-8 in.	57,500
562/688	450/550	220/250	4	6	18 ft.-9½ in.	8 ft.-4½ in.	4 ft.-8 in.	68,350
750/920	600/735	220/250	4	8	23 ft.-4 in.	8 ft.-4½ in.	4 ft.-8 in.	87,500



Diesel-electric passenger and automobile ferry FRESNO—Four diesel generating sets—Two propulsion motors each 1250 S. H. P.

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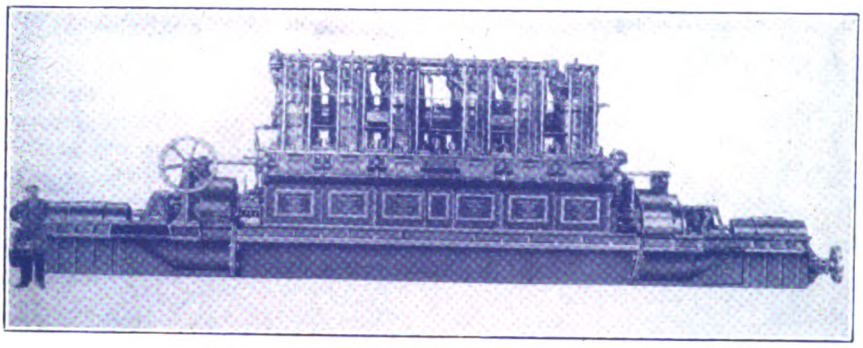
Diesel Direct Drive in Ferryboat Golden City

One Engine—600 B. H. P.



DESCRIPTION

One engine of this size and type replaced a steam plant in the ferry GOLDEN CITY. A special clutch and reduction gear is provided at each end of the engine. When one clutch is engaged the other is automatically released.

Engine

Name of Engine—Washington-Estep; **Year**—1927
Builder—Washington Iron Works
Cycle—4; **No. of Cylinders**—6; **B. H. P.**—600
I. H. P.—698; **Action**—Single; **Injection**—Solid
Scavenging—None; **Piston Cooling**—None
Bore—17 in.; **Stroke**—24 in.; **R. P. M.**—190-200
Piston Speed—760-800 feet per minute
Pressure Indicated—84.7; **Pressure Brake**—72.9
B. H. P. per Cyl.—100; **I. H. P. per Cyl.**—116.33
Mechanical Efficiency—86%; **Stroke to Bore**—1.41
Wkg. Strokes per Rev.—3; **Lgth. O. A.**—45 ft. 9 in.
Height O. A.—12 ft. 7⅜ in.; **Width**—6 ft. 7 in.
Weight—170,000 lbs.; Lbs. per b. h. p.—283
Reversing—No. By means of clutch at both ends
Air Compressor—Single stage, attached to engine; Also 16 h. p. diesel engine auxiliary compressor

Vessel

Name—Golden City; **Type**—Harbor ferryboat
Main Drive—Diesel, clutch connected to propeller shafts at each end of engine; Reduction gears
Length B. P. P.—176.65 ft.; **Beam**—30.5 ft.
Depth—12.7 ft.; **Gross Tons**—353.37
Net Tons—233; **Speed**—13 knots
No. of Propellers—Two; One at each end of vessel
Fuel Consumption—Lbs. per b. h. p. per hr.—0.41

Remarks

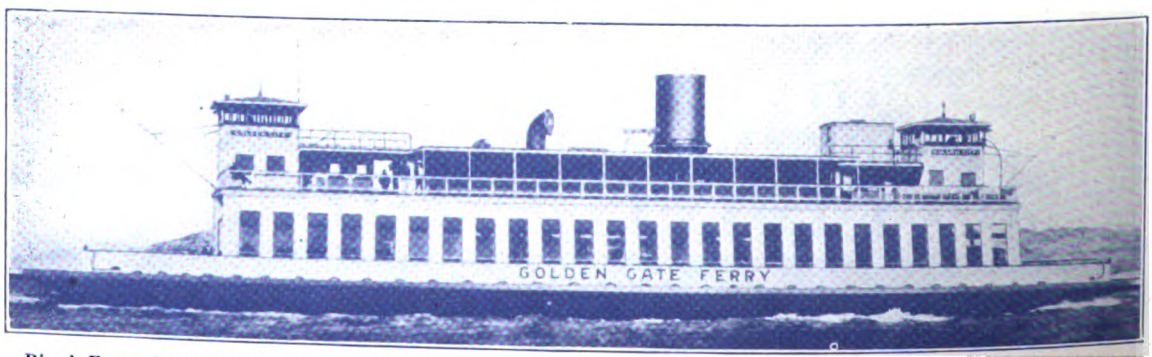
The ferryboat GOLDEN CITY, owned by the Golden Gate Ferry Co., is used as an automobile and passenger ferry from the foot of Hyde street, San Francisco, to Sausalito, Calif. The present diesel engine installation represents a conversion from steam. The original steam plant, which was removed, formerly served on the old destroyer FARRAGUT. The 600 brake horsepower diesel engine described and illustrated on this page was lined up to the steam thrust bearings and propeller shafts without any extensive alterations to the hull.

A special clutch and reduction gear at each end of the engine are inter-connected and controlled from one wheel at the operating station so that when one clutch is engaged the other is automatically released. With the engine always turning in the same direction maneuvering is accomplished by operating one or the other of the two clutches to bring the forward or astern propeller into action as desired.

By this drive arrangement all the power may be applied to the after propeller while the forward propeller is allowed to turn idle. It is claimed that the overall efficiency is appreciably greater than with a solid through double end drive.

Sizes of Engines Built

Range from 36 to 1800 B. H. P.



Diesel Ferry GOLDEN CITY—San Francisco harbor—One 600 B. H. P. engine—Clutch connected at each end to shaft

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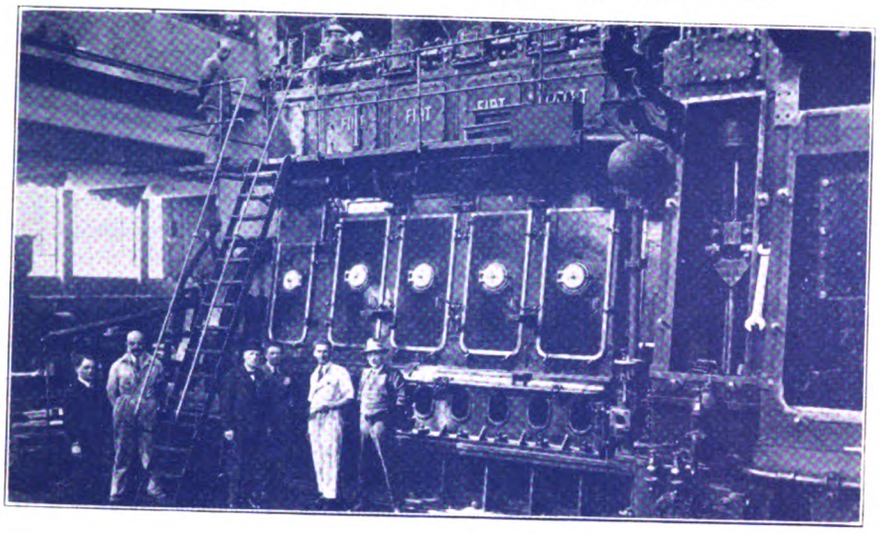
Diesel Electric Drive in La Playa

Four Engines—Each 1000 B. H. P.



DESCRIPTION

This vessel, belonging to the United Fruit Co., is equipped with diesel electric drive. Four engines of the size and type described are each direct connected to a main and auxiliary generator. The engines are of the crosshead type with division plate between the cylinders. The three stage compressor built integral with the engine is set at the forward end.

Engine

Name of Engine—Fiat Q-504; **Year**—1927
Builder—Fiat Co., Italy, Nordberg Mfg. Co. is American licensee for this type
Cycle—2; **No. of Cylinders**—4; **I. H. P.**—1250
B. H. P.—1000; **Action**—Single; **Injection**—Air
Scavenging—Port; **Piston Cooling**—Water Cooling
Bore—19.69 in.; **Stroke**—19.69 in.; **R. P. M.**—250
Piston Speed—816 ft. p. m.; **Press. Indicated**—79.5
Pressure Brake—65; **B. H. P. per Cyl.**—250
Mechan. Efficiency—79.6%; **Stroke to Bore**—1.00
Working Strokes per Revolution—4
Length O. A.—18 ft. 6 in.; **Height**—17 ft. 2 in.
Width O. A.—8 ft. 4 in.; **Weight**—One engine, 179,200 lbs.; Lbs. per b. h. p. per hour, 179.2
Reversing—No; constant speed one direction
Air Comp.—Three stage, integral with engine

Vessel

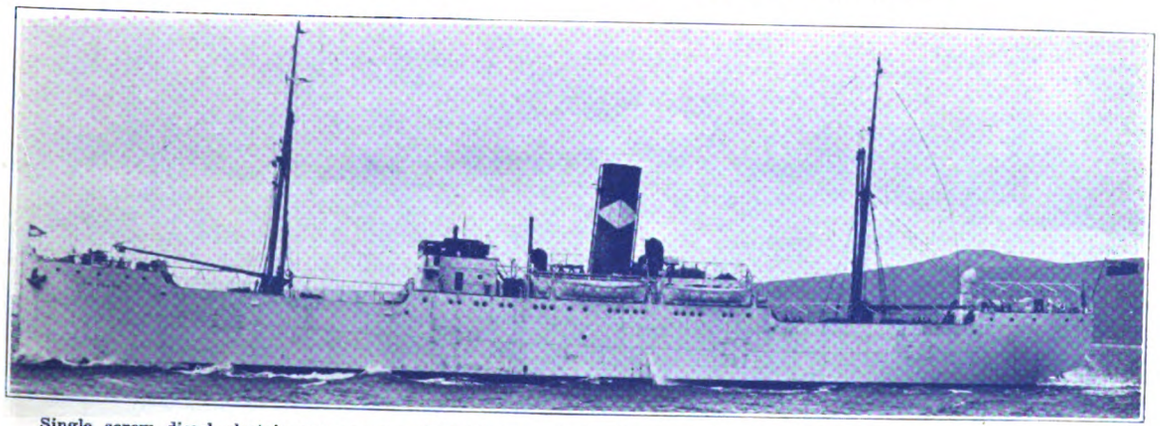
Name—La Playa; **Type**—Cargo and passenger
Main Drive—Diesel electric; **Lgth. B. P.**—352.2 ft.
Beam—48.1 ft.; **Depth**—28.3 ft.
Deadweight—5000 tons; **Speed**—13 knots
No. of Propellers—One; **Fuel Consumption**—Lbs. per b. h. p. per hr.—0.405
Generators—Eight; Four of 500 k. w. and 4 of 200 k. w., one of each in series direct connected to and driven by the engine described and shown here at 250 r. p. m.

Remarks

The LA PLAYA was built in England for the United Fruit Co. Her present engines were built by the Fiat Stabilimento Grandi Motori, Turin, Italy.

Since this vessel belongs to an American company and as this type of engine can now be built in the United States by the Nordberg Mfg. Co., it was decided to include this installation, though it is not American built.

A large amount of refrigeration is required on the LA PLAYA, the refrigerating and auxiliary load amounting to nearly 22 per cent of the power required for propulsion.



Single screw diesel electric passenger and freight vessel LA PLAYA—Four 1000 H. P. Fiat engines drive generators

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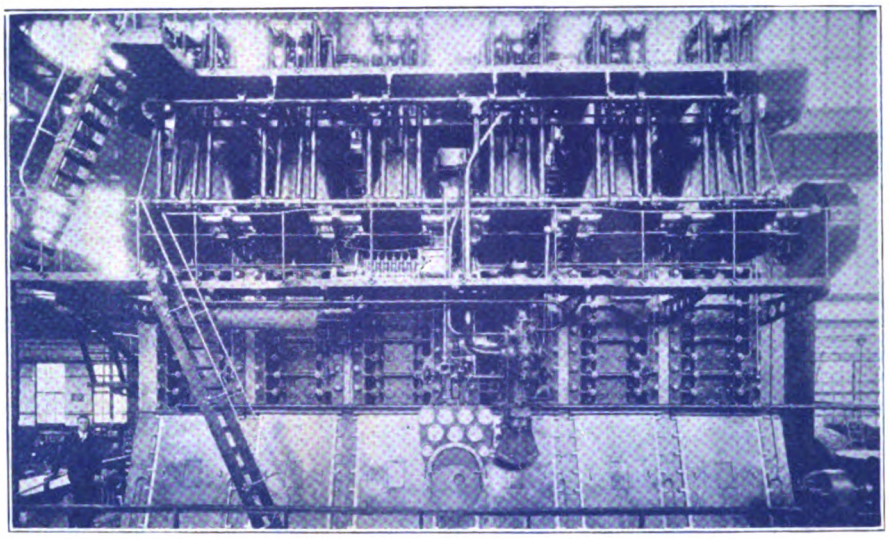
Diesel Direct Drive in Freighter Crown City

One Single Acting Engine—2700 B. H. P.



DESCRIPTION

One engine of this size and type is direct connected to the propeller shaft. It is a single acting, direct reversible vertical four stroke cycle crosshead type developing 2700 brake horsepower. There is an independent compressor unit driven by a 400 horsepower 4 cycle engine. The main engine is directly reversible by means of air. The engine is arranged with individual frames.

Engine

Name of Engine—McIntosh & Seymour 1927
Builder—McIntosh & Seymour Corp., Auburn, N. Y.
Cycle—4; **No. of Cylinders**—6; **B. H. P.**—2700
Action—Single; **Injection**—Air; **Scavenging**—None
Piston Cooling—Water Cooling; **Bore**—32 inches
Stroke—60 in; **R. P. M.**—95; **Speed**—950 f. p. m.
B. H. P. per Cyl.—450; **Stroke to Bore**—1.875
Wkg. Str. per Rev.—3; **Length O. A.**—40 ft. 0 in.
Height O. A.—33 ft. 6 in.; **Width O. A.**—11 ft. 6 in.
Reversing—By Air; **Air Comp.**—3 stage, independent

Vessel

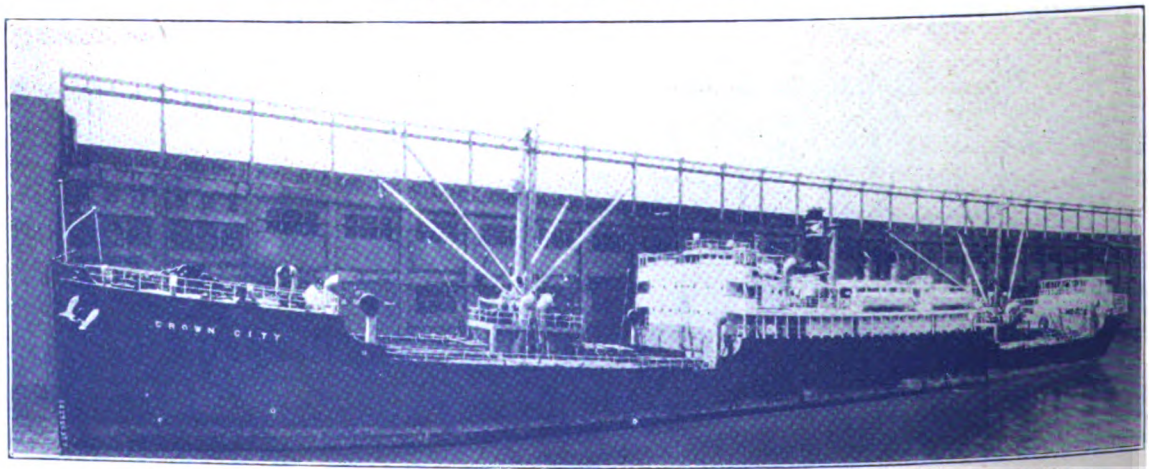
Name—Crown City; **Owner**—U. S. Shipping Board
Converted to Diesel—At Fore River, Beth. S. B. Co.
Type—Single screw steel, ocean cargo vessel
Main Drive—One direct connected diesel engine
Length B. P. P.—410 ft.; **Beam Molded**—54 ft.
Depth—29 ft. 9 in.; **Draft**—23 ft. 11¼ in. (summer)
Displacement—12,086 tons; **Deadweight**—8006 tons
Speed—11 knots; **No. of Propellers**—One
Fuel Consumption—Lbs. per b. h. p. hr., 0.42

The CROWN CITY is one of the first twelve vessels converted from steam to diesel drive by the United States shipping board. The conversion was carried out at the Fore River plant of the Bethlehem Shipbuilding Corp. A successful sea trial was held on Feb. 19, 1927, shortly after which this vessel was allocated to the Roosevelt Steamship Co. for service to Australia-India.

This vessel is now an economical modern freight carrier and is in a position to compete favorably with recent foreign diesel vessels of similar type and power.

Sizes of Engines Built

Range from 100 to 10,000 B. H. P.



M. S. CROWN CITY—single screw freighter—One 2700-brake horsepower diesel engine direct connected

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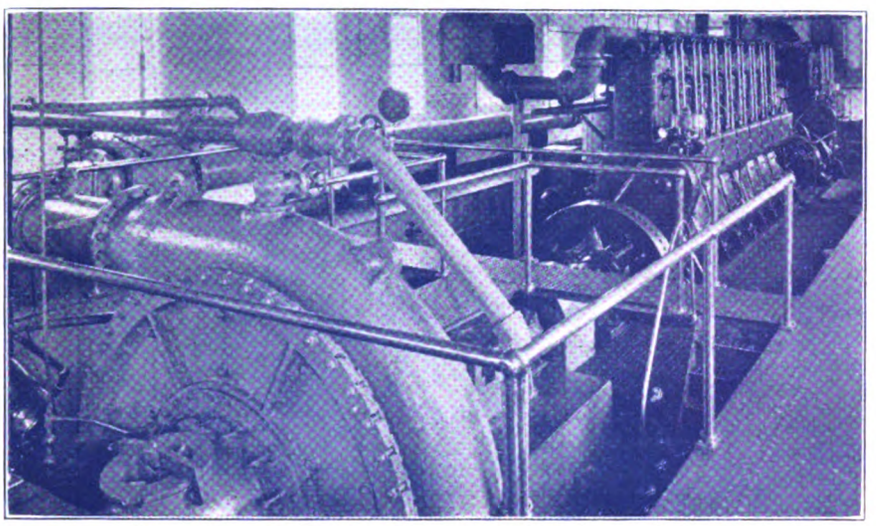
Diesel Direct Pump Drive on Hydraulic No. 3

One Engine— 500 B. H. P.



DESCRIPTION

In this dredge a 500-horsepower engine is connected through a flexible coupling to a 15-inch Morris dredge pump designed to deliver 195 cubic yards of solids through a 15-inch line 2400 feet long against a maximum static head of 40 feet. The governor is equipped with hand throttle for speed variation. The engine is of the four cycle, solid injection, marine diesel type of rugged and simple construction.

Engine

Name of Engine—De La Vergne; **Year**—1927
Builder—De La Vergne Machine Co.; **Cycle**—4
No. Cylinders—8; **B. H. P.**—500; **I. H. P.**—595
Action—Single; **Injection**—Solid; **Piston Clg.**—No
Scavenging—No; **Bore**—14½ in.; **Stroke**—18 in.
R. P. M.—275; **Piston Speed**—831 ft. p. m.
Pressure Indicated—72; **Pressure Brake**—60.5
B. H. P. per Cyl.—62½; **I. H. P. per Cyl.**—74½
Mechanical Efficiency—84%; **Stroke to Bore**—1.24
Working Strokes per Revolution—4
Length—Including Dredge Pump—39 ft. 9¼ in.
Height O. A.—8 ft. 4¾ in.; **Width O. A.**—56 in.
Weight—One engine 75,800 lbs.; Lbs. per b. h. p. one engine, 151; Lbs per i. h. p. one engine, 127
Reversing—No; **Air Comp.**—One, motor drive

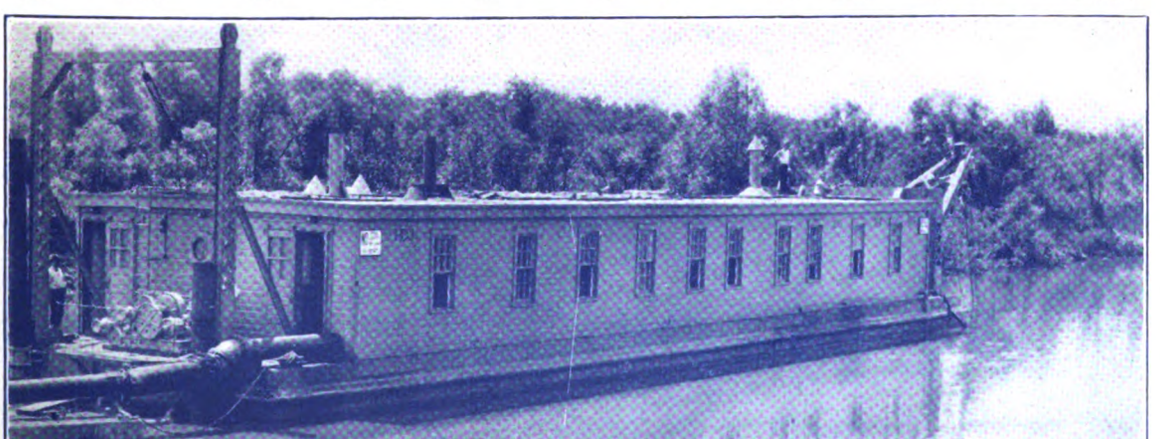
Vessel

Name—Hydraulic No. 3; **Type**—Dredge
Main Drive—Not self-propelled; Power for pumps
Length B. P.—108 ft.; **Beam**—26 ft; **Draft**—4½ ft.
Fuel Capacity—762 bbls.; **Fuel Consumption**—Lbs per b. h. p. per hr., 0.45; per i. h .p., 0.383
Generator—One, Westinghouse, 130 k. w. driven by one 200 h. p. De La Vergne diesel at 277 r. p. m.

This dredge was designed by the engineering department, Division of Canals, the State of New York, at Syracuse, New York, and operates on the Barge canal with the canal terminal at Syracuse as headquarters.

Some of the Standard Sizes of Engines Built

I. H. P.	B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A. feet	L. O. A. inches	Height feet	Height inches	Width feet	Width inches	Weight
475	400	277	4	6	18	4	8	4¾	4	8	56,000
590	500	225	4	5	21	4	12	2½	6	6	103,900
950	800	225	4	8	30	4	12	2½	6	6	153,900
1100	940	180	4	5	27	6	14	3⅞	8	6	188,900
1790	1500	180	4	8	38	9	14	3⅞	8	6	283,600



Dredge HYDRAULIC No. 3—Equipped with 500 H. P. diesel dir ect pump drive—Also 200 H. P. diesel generating set

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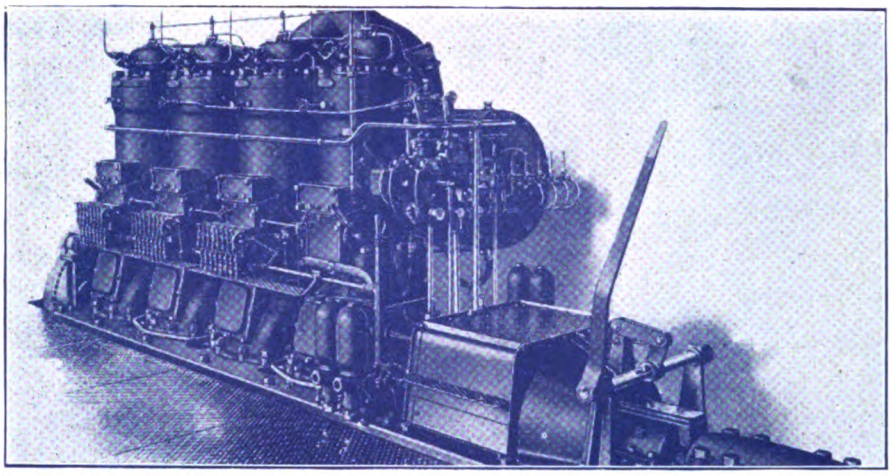
Diesel Direct Drive in Freighter Maimuna

One Engine—350 B. H. P.



DESCRIPTION

One engine of this size and type was installed in the vessel illustrated below. The engine operates on the two stroke cycle with low compression, surface ignition and solid injection. It is of the trunk piston crankcase compression type and is direct reversible in sizes above 120 b. h. p.

Engine

Name of Engine—Bolinders; **Year**—1927
Builder—Bolinders Co. Inc.
Cycle—Two; **No. of Cylinders**—4; **B. H. P.**—350
Action—Single; **Injection**—Solid
Scavenging—Crankcase; **Piston Cooling**—None
Bore—16½ in.; **Stroke**—18⅞ in.; **R. P. M.**—275
Pressure Indicated—42.5; **Pressure Brake**—35 lbs.
B. H. P. per Cyl.—87½; **Mechanical Eff.**—80%
Stroke to Bore—1.14; **Wkg. Strokes per Rev.**—4
Length O. A.—19 ft.; **Height O. A.**—7 ft. 6 in.
Width Overall—4 ft. 3 in.; **Weight**—47,500 lbs
Reversing—Direct reversible by impulse
Air Comp.—None; **Starting**—Surface ignition
Auxiliaries—One 7 h.p. and one 12 h.p. Bolinder engine

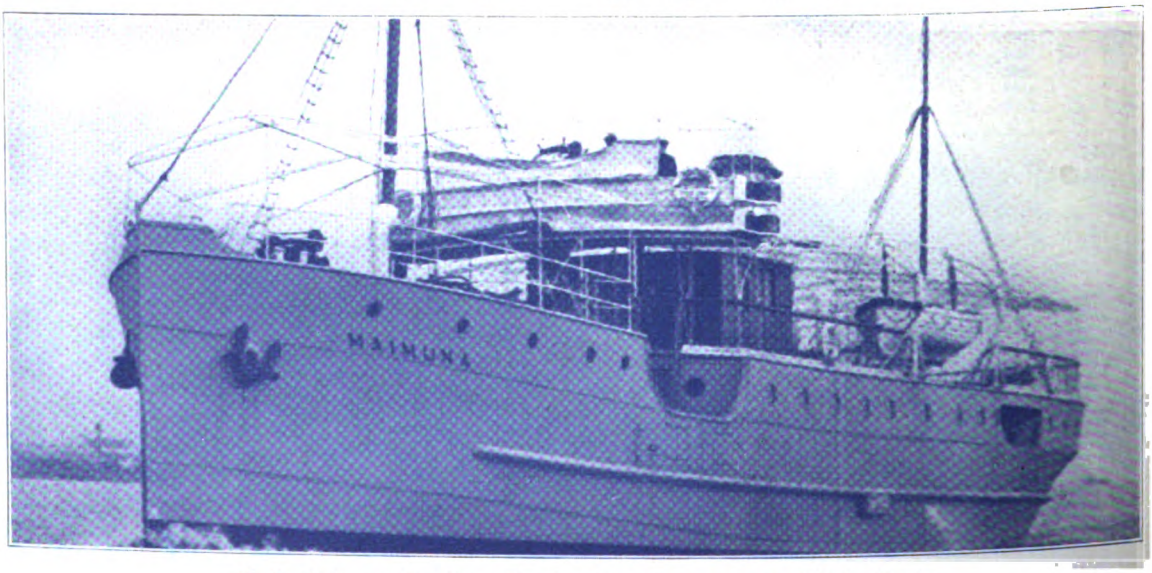
Vessel

Name—Maimuna; **Type**—Motor Freighter
Main Drive—Direct connected marine oil engine
Length B. P. P.—140 ft.; **Beam**—30 ft. 0 in.
Draft—12 ft. 0 in.; **Speed**—10 miles
No. of Propellers—One
Fuel Consumption—Lbs. per b. h. p. per hr.—0.45

The installation of this size oil engine in a freight vessel of so considerable a size gives an economical power plant.

Some of the Larger Sizes of Engines Built

Type	B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A. feet	L. O. A. inches	Hght. above shaft feet	Hght. above shaft inches	O. A. Width feet	O. A. Width inches	Weight
B-25-M-40	180	400	2	4	14	6	5	3	4	1 7/16	20,000
B-30-M-40	240	375	2	4	15	7¼	5	7½	4	5½	23,500
B-40-M-40	300	300	2	4	17	6¾	6	6¾	5	½	35,500
B-50-M-40	400	275	2	4	19	8¼	7	4½	6	5⅝	47,500
B-60-M-40	600	200	2	4	24	5¼	10	6	8	10 1/16	113,000



M. S. Maimuna—Freighter—Fitted with One 350 B. H. P. Bolinder Engine

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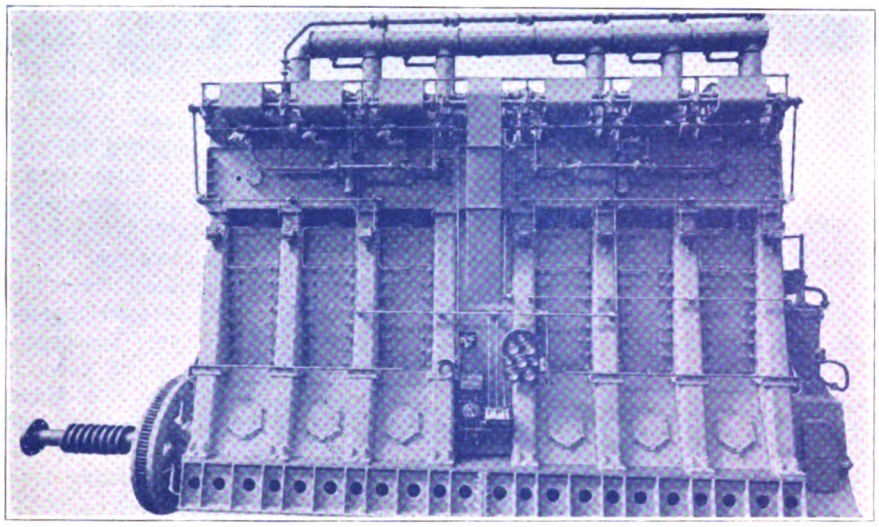
Diesel Direct Drive in Freighter Ashbee

One Engine—1540 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to propeller is installed in the ASHBEE and sister vessel JACKSONVILLE. This engine is of heavy duty, single acting, marine type, direct reversing. The cylinder skirt is detachable for quick inspection or removal of main pistons. There is forced feed lubrication. The ASHBEE has covered over 100,000 miles to date.

Engine

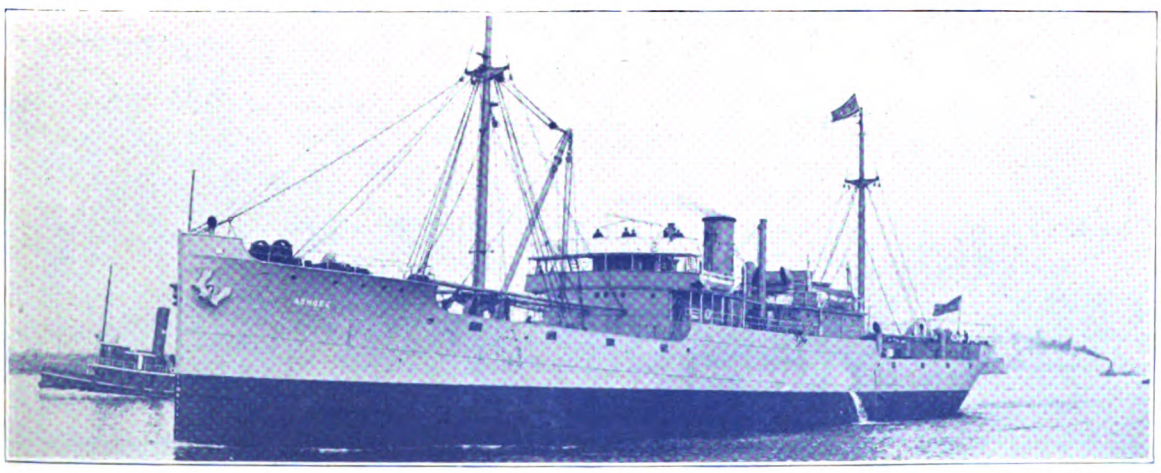
Name of Engine—A. B. B. Werkspoor 1923
Builder—American Brown Boveri Electric Corp.
Cycle—Four; **No. of Cyls.**—6; **I. H. P.**—2000
B. H. P.—1540; **Action**—Single acting. marine
Injection—Air; **Piston Cooling**—Sea water
Bore—27 in.; **Stroke**—47 in.; **R. P. M.**—110
Piston Speed—860 ft. p. m.; **Pressure Ind.**—91
Pressure Brake—70; **B. H. P. per Cyl.**—250
I. H. P. per Cyl.—333; **Mechanical Eff.**—77%
Stroke to Bore—1.74; **Wkg. Stks. per Rev.**—3
Length O. A.—39 ft. 4 in. (without flywheel)
Height—22 ft. 4 in. (to center of crank shaft)
Width Overall—10 ft. 3 in.
Weight—One engine, 582,400 lbs.; One engine, 377 lbs. per b. h. p.
Reversing—Direct, by ahead and astern cams.
Air Comp.—Three-stage, attached to engine

Vessel

Name—Ashbee; Converted—New York S. B.
Type—Single screw ocean going cargo vessel
Main Drive—One diesel engine direct connected
Length B. P. P.—334 ft. 6 in.; **Beam**—48 ft.
Depth—27 ft. 6 in.; **Draft**—22 ft. 6⅝ in.
Displacement—8125 tons— Speed—10 knots
Fuel Capacity—6300 bbls. or 868 tons
Fuel Consumption—Lbs. per b. h. p. per hr.—0.38; Lbs. per i. h. p. per hr.—0.30; Tons per day—for all purposes—6.8; Radius without refueling is 28,800 miles.
Generators—Three of 40 kilowatts each at 375 r. p. m.; Built by General Electric Co.; Direct diesel driven by 60 h. p. Worthington.

The motorship ASHBEE was converted from a steamship by the New York Shipbuilding Corp. in 1923. She has logged to date over 100,000 miles and is in regular service between New York and the West Coast of South America.

Her engine responds with remarkable ease to bells from the bridge, docking without tugs.



M. S. Ashbee equipped with one 1540 B. H. P. A. B. B. Werkspoor diesel has logged over 100,000 miles

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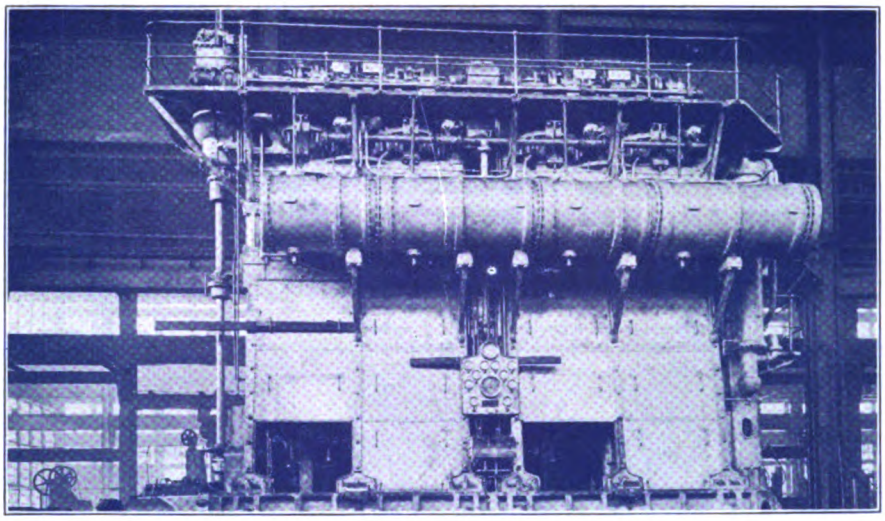
Diesel Direct Drive in Tanker Gulfpride

Two Engines—Each 2100 B. H. P.



DESCRIPTION

Two single acting engines of this size and type, direct connected to separate propellers, are installed in the tanker GULFPRIDE owned and operated by the Gulf Refining Co. These engines are of heavy duty, two-cycle, direct reversible, crosshead type. Scavenging system is of valve-in-head type. A three-stage injection, air compressor is of differential piston type.

Engine

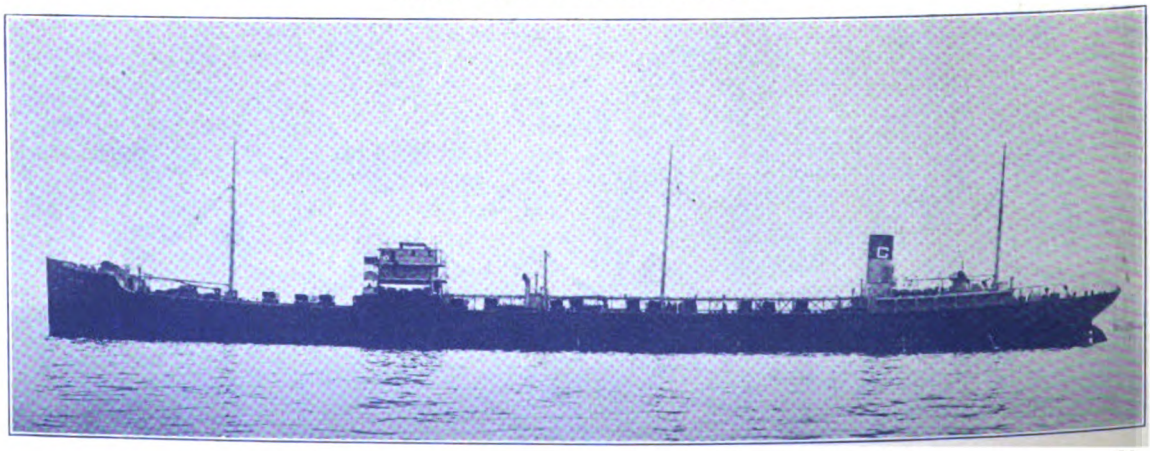
Name of Engine—Bethlehem; **Year**—1926
Builder—Bethlehem Steel Co.
Cycle—Two; **No. of Cylinders**—4; **I. H. P.**—2860
B. H. P.—2100; **Action**—Single acting, marine type
Injection—Air; **Piston Cooling**—By salt water
Bore—26 in.; **Stroke**—48 in.; **R. P. M.**—120
Piston Speed—960 ft. p. m.; **Pressure Ind.**—90
Pressure Brake—68; **B. H. P. per Cylinder**—525
I. H. P. per Cyl.—715; **Mechanical Eff.**—73.5%
Stroke to Bore—1.845; **Wkg. Strokes per Rev.**—4
Length—33 ft. 8 in. (including thrust bearing)
Height—28 ft. 4 in. (above c. l. of crank shaft)
Width Over All—14 feet 8 inches
Weight—One engine, 590,000 lbs. (includes flywheel, thrust bearing, auxiliary pumps); Pounds per B. H. P.—280; Pounds per I. H. P.—206
Reversing—Direct; **Air Comp.**—Attached to engine
Pumps—Lub. oil, cooling water, fuel oil, and sanitary are all attached to main engine.

Vessel

Name—Gulfpride; **Builder**—Federal S. B. & D. D. Co.
Type—Twin screw ocean going oil tanker
Main Drive—Two diesel engines direct connected
Length B. P. P.—525 ft.; **Beam**—74 ft.
Depth—40 ft. 6 in.; **Draft**—28 ft.
Displacement—21,480 tons; **Ddwght.**—17,400 tons
Speed—11 knots; **No. of Propellers**—2 (3-blade)
Fuel Capacity—About 5630 bbls., or 800 tons
Fuel Consumption—(Approx. av.) Lbs. per B. H. P. per hr.—0.425; Lbs. per I. H. P. per hr.—0.313; Tons per day—At full power (4200 s. h. p.)—19; Sailing radius—12,000 miles at full power
Generators—Three of 100 kilowatts each at 260 r. p. m.; Built by Westinghouse Elec. & Mfg. Co.; Direct diesel driven by Nelseco engines.

The motor tanker GULFPRIDE is the first built on the Isherwood bracketless system, in America. Transports gasoline and kerosene in bulk from Port Arthur, Texas, to northern Atlantic ports for the Gulf Refining Co.

Range from 90 to 4800 B. H. P.



M. S. GULFPRIDE—twin screw diesel tanker of 17,400 tons deadweight

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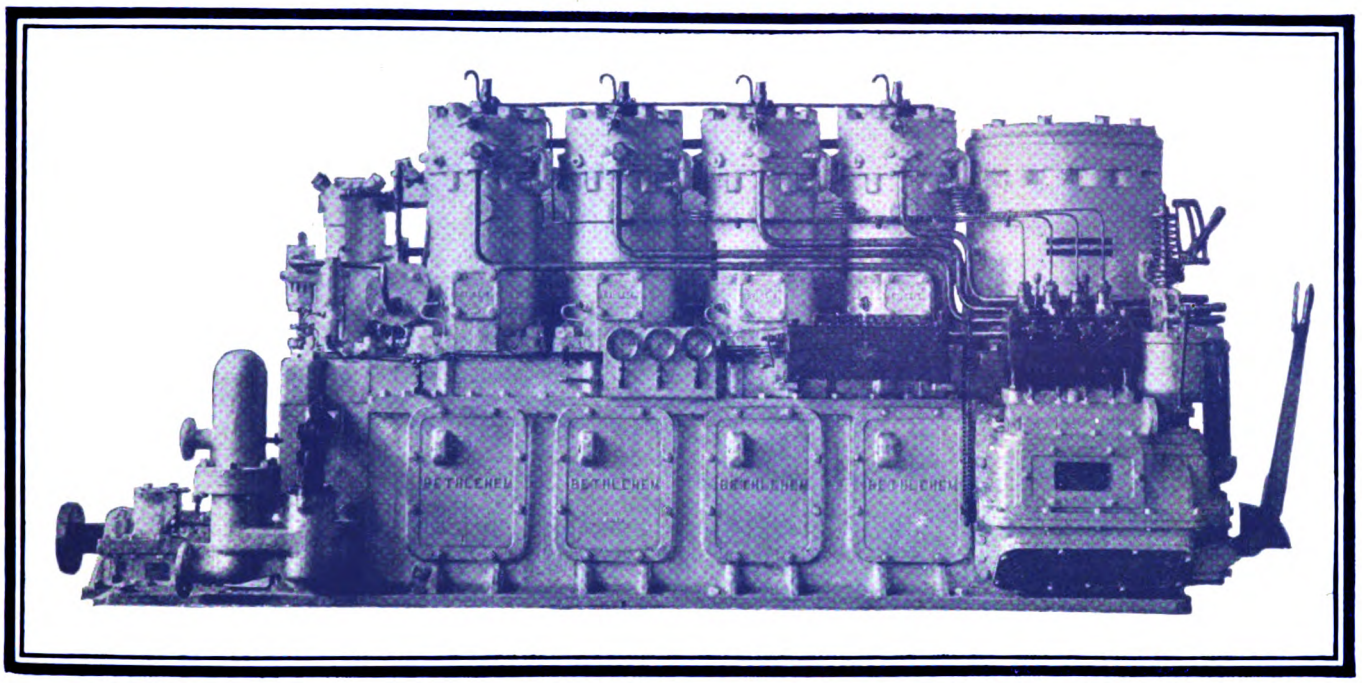
BETHLEHEM
Diesel Engines



A 4 cylinder 320 S.hp Bethlehem Type M Diesel Engine.

The percentage of thermal efficiency in a Diesel Engine is more than twice that of a Steam Power Plant of the same power capacity.

The purchaser of a Bethlehem Diesel Engine secures the dual advantage of Diesel efficiency and Bethlehem quality.

Bethlehem Diesel Engines are giving service as prime movers for large ocean vessels, and for yachts, tugs, ferries and other small craft. They are also in use as auxiliary drives on large vessels.

The Type M engines are built in units of 3, 4 and 6 cylinders in sizes ranging from 90 to 570 S.hp., and the Large Unit Type Engines are built in units of 4, 6 and 8 cylinders ranging in size from 2,000 to 5,000 S.hp.

BETHLEHEM STEEL COMPANY, *General Offices:* **BETHLEHEM, PA.**

District Offices:

New York **Boston** **Philadelphia** **Baltimore** **Washington** **Atlanta** **Pittsburgh** **Buffalo**
Cleveland **Cincinnati** **Detroit** **Chicago** **St. Louis** **San Francisco** **Los Angeles** **Seattle** **Portland**

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of Our Commercial Products

BETHLEHEM

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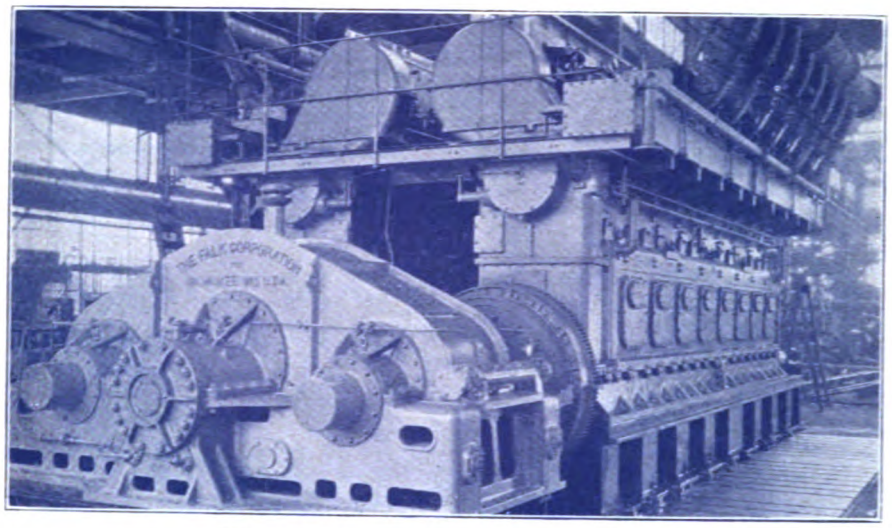
Geared Diesel Drive in Tanker Herman Falk

Two Engines—Each 1300 B. H. P.



DESCRIPTION

The main drive of the tanker, HERMAN FALK, consists of two 8-cylinder, enclosed, trunk type, Falk reversible diesel engines connected by means of Falk flexible couplings to a reduction gear unit located at the forward end of the engine. Reversing, starting and speed control is common to both engines which handle exactly as one unit.

Engine

Name of Engine—Falk twin 8-geared; **Year**—1927
Builder—The Falk Corp.; **Cycle**—Four
No. of Cyl.—8; **I. H. P.**—1625; **B. H. P.**—1300
Action—Single; **Injection**—Solid; **Scaveng.**—Yes
Piston Clg.—None; **Bore**—18 in.; **Stroke**—22½ in.
R. P. M.—Engine, 275; propeller—90 (gear reduc.)
Piston Speed—1030 ft. p. m.; **Pressure Ind.**—105
Pressure Brake—83; **B. H. P. per Cyl.**—165
I. H. P. per Cyl.—209; **Mech. Efficiency**—Including gears, 78.8%
Stroke to Bore—1.25; **Wkg. Strokes per Rev.**—4
Lgth. O. A.—39 ft. 1½in.; **Hght. O. A.**—11 ft. 6 in.
Width Overall—14 ft. 1 in. twin geared unit
Weight—Two engines and gears 485,000 lbs.; Lbs. per B. H. P.—186.5; Lbs. per I. H. P.—149.1
Reversing—By air, both engines in unison
Air Compressor—For starting only—350 lbs

Vessel

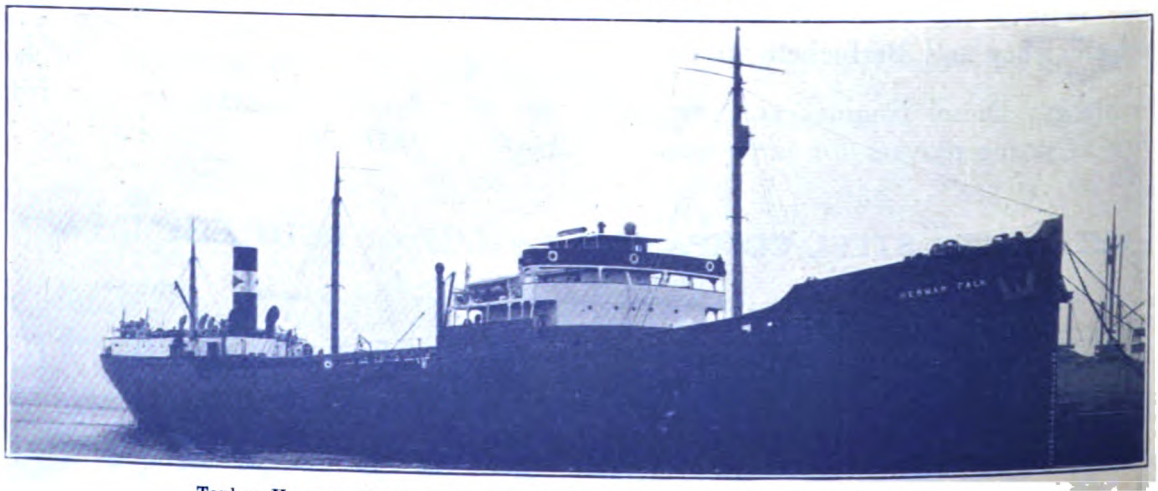
Name—Herman Falk (ex Tuxpanoil), tanker
Main Drive—Single screw, twin diesel geared
Length B. P. P.—431 ft.; **Beam**—59.2 ft.
Depth—31.4 ft.; **Draft**—27.5 ft.; **Speed**—10.8 kts
No. of Propellers—One; **Fuel Capacity**—7500 bbls.
Fuel Consumption—Lbs. per b. h. p. per hr.—0.41
Generator—One of 110 k. w. at 450 R. P. M. Falk diesel engine G. E. generator, direct connected

Remarks

The conversion of the tanker HERMAN FALK (ex TUXPANOIL) was carried out at the Sparrows Point plant of the Bethlehem Shipbuilding Corp. under C. E. Ross, marine consulting engineer, New York. The interesting twin diesel engine geared unit installed was designed by O. A. Banner, engineer and manager of the oil engine department of the Falk Corp.

The port and starboard boilers were retained and the center one removed.

The HERMAN FALK carries oil in bulk, having already made a number of successful trips, is owned by the Oil Transport Co., and operates on charter.



Tanker HERMAN FALK—Main drive, twin geared diesel engines—single screw

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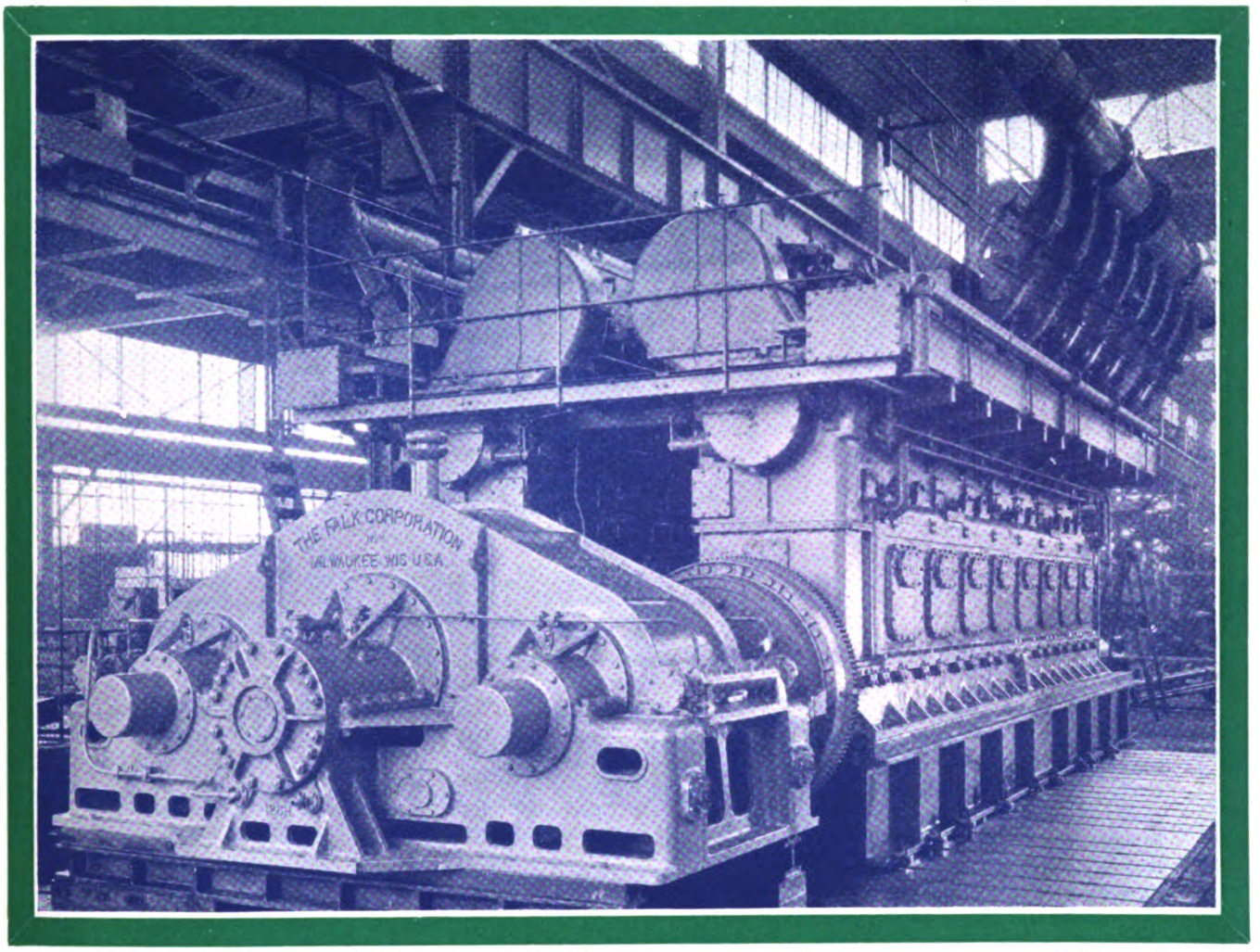

Falk Twin-Eight Geared Marine Engine

The Power Plant of Tanker HERMAN FALK

(EX TUXPANOIL)

The Falk System of coupling two oil engines and a reduction gear by means of a Falk Flexible Coupling offers an ideal combination for the conversion of single screw ships.

The Falk System gives you a power plant that is vibrationless, quiet, strong, light, compact—and dependable.

Slow propeller speed gives maximum propeller efficiency—with next to no power loss in the gearing.

We Build Complete Single and Twin Marine Oil Engines—Gear Units for Single and Twin Oil Engine Drives—Reversing Gear Units.

The Falk Corporation—Milwaukee

FALK

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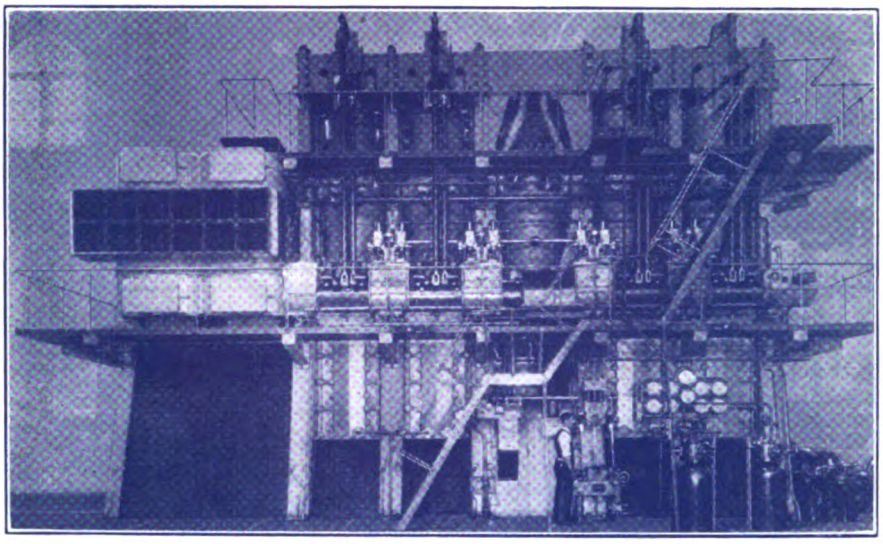
Diesel Direct Drive in Freighter Seminole

One Double Acting Engine—3800 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to the propeller shaft has been installed in the 9400-deadweight ton freighter SEMINOLE at the Tietjen and Lang plant, Hoboken, N. J. This powerful engine is one of four working on the double acting principle developed by three American builders as a result of the conversion from steam to diesel initiated by the government.

Engine

Name of Engine—Hamilton M. A. N.; **Year**—1927
Builder—The Hooven, Owens, Rentschler Co.
Cycle—Two; **No. of Cylinders**—4; **I. H. P.**—5200
B. H. P.—3800; **Action**—Double acting
Injection—Air; **Scavenging**—Port scavenging
Piston Cooling—Fresh water; **Bore**—27½ inches
Stroke—47¼ in; **R. P. M.**—115; **Piston Speed**—900 f. p. m.
Pressure Ind.—85 lbs.; **Pressure Brake**—65 lbs.
B. H. P. per Cyl.—950; **I. H. P. per Cyl.**—1300
Mechanical Eff.—73%; **Stroke to Bore**—1.718
Wkg. Strokes per Rev.—8; **Lgth. O. A.**—32 ft. 0 in.
Height O. A.—27 ft. 6 in.; **Width O. A.**—16 ft. 0 in.
Weight—868,000 lbs.; Lbs. per B. H. P.—229 lbs.
Reversing—By air, sliding camshaft
Air Compressor—Three stage vertical, attached

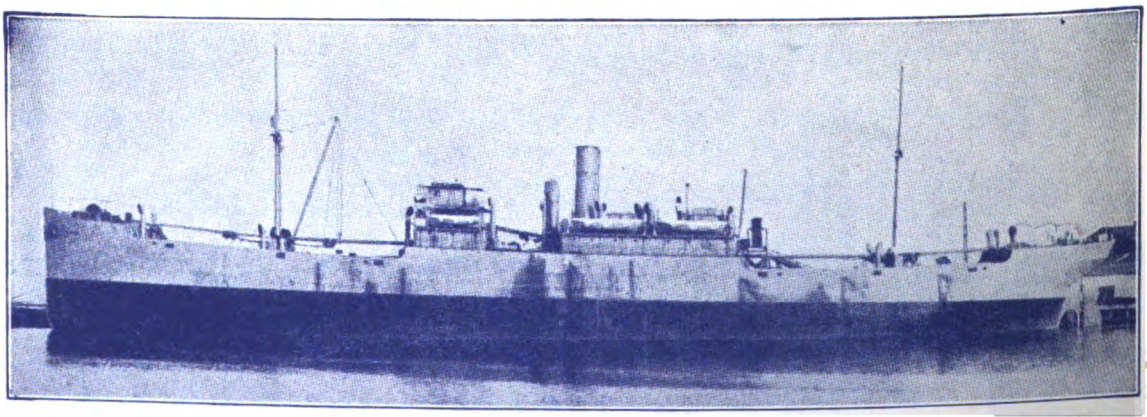
Vessel

Name—Seminole; **Type**—Ocean freighter
Main Drive—Single screw. Direct D. A. diesel
Length—416 ft.; **Beam**—54 ft.; **Depth**—33 ft. 9 in.
Draft—26 ft. 10¾ in.; **Displacement**—13,000 tons
Deadweight—Approx. 9400 tons; **Speed**—12.5 kts.
Fuel Cap.—760 tons; **Fuel per Day**—18 tons
Fuel—Lbs. per B. H. P. per hr.—0.44; per I. H. P. —0.325
Radius Without Refueling—14,000 miles
Generators—Three of 75 k. w. each at 265 r. p. m. Direct connected to Worthington diesels; also with compressor of 170 cu. ft. p. m. free air

Remarks

The work of converting the shipping board freighter SEMINOLE was carried out at the Tietjen & Lang plant of the Todd Shipyards Corp., Hoboken, N. J. Her sea trials were to be held on Oct. 27 out of New York.

This two cycle double acting diesel engine is of the vertical marine type with built up crankshaft, marine style connecting rod and single crosshead guide. The framing consists of a lower housing supported on the bedplate with entablature setting on the housing, and above, upper columns connecting to the upper entablature.



Oscar Daniels type freighter fitted with one 3800 B. H. P. double acting Hooven, Owens, Rentschler diesel engine

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FACTS

about

HAMILTON M.A.N. DIESEL ENGINES

Ten years ago this Company built its first Steam Marine Engine—since then nearly 400,000 horse power have been constructed.

Two years ago this Company began the construction of its first Diesel Engine—with the following result:—

Completed

Two Single Acting Two Cycle Engines
1650 BHP each at 90 RPM

One Double Acting Two Cycle Engine
3900 BHP at 115 RPM

Under Construction

Two Double Acting Two Cycle Engines
4000 BHP at 110 RPM

A total of 15,200 Horse Power

The Hooven, Owens, Rentschler Co.

Hamilton Engines and Machinery

HAMILTON, OHIO

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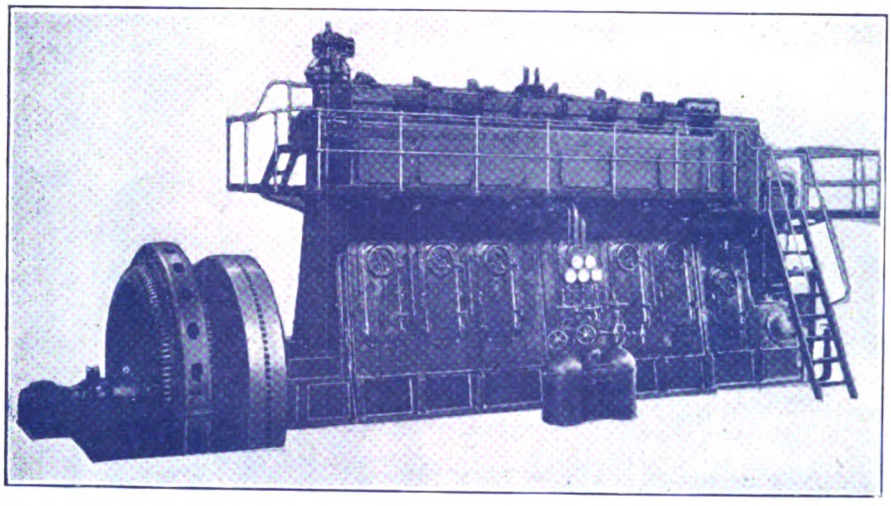
Diesel Generator Sets on Dredge New Jersey

Four Engines—Each 1150 B. H. P.



DESCRIPTION

Four engines of this size and type each directly connected to generators are installed on the pipe line dredge, New Jersey. The engines are of the builder's two cycle, crosshead type. They are built nonreversing with constant speed governors. Pressure lubrication is provided for bearings and timed forced feed lubricators supply oil for the cylinders.

Engine

Name of Engine—Busch-Sulzer 6-CE-17; Yr.—1927
Builder—Busch-Sulzer Bros. Diesel Engine Co.
Cycle—2; **No. of Cylinders**—6; **B. H. P.**—1150
Action—Single; **Injection**—Air; **Scaveng.**—Port
Piston Coolg.—Water; **Bore**—17 in.; **Stroke**—27 in.
R. P. M.—180; **Piston Speed**—810 feet p. m.
Pressure Brake—68.8; **B. H. P. per Cyl.**—196.7
Working Strokes per Rev.—6; **Lgth.**—Over engine and generator 39 ft. 0 in.; **Height**—From center line of shaft, 14 ft. 9 in.; **Width**—Engine, 6 ft. 11 in.; Over generator frame 10 ft. 8 in.
Weight—212,000 lbs.; **Per B. H. P.**, 184.5 lbs.
Reversing—Non-reversing
Air Comp.—Direct con., 3-stage, crankshaft drive

Vessel

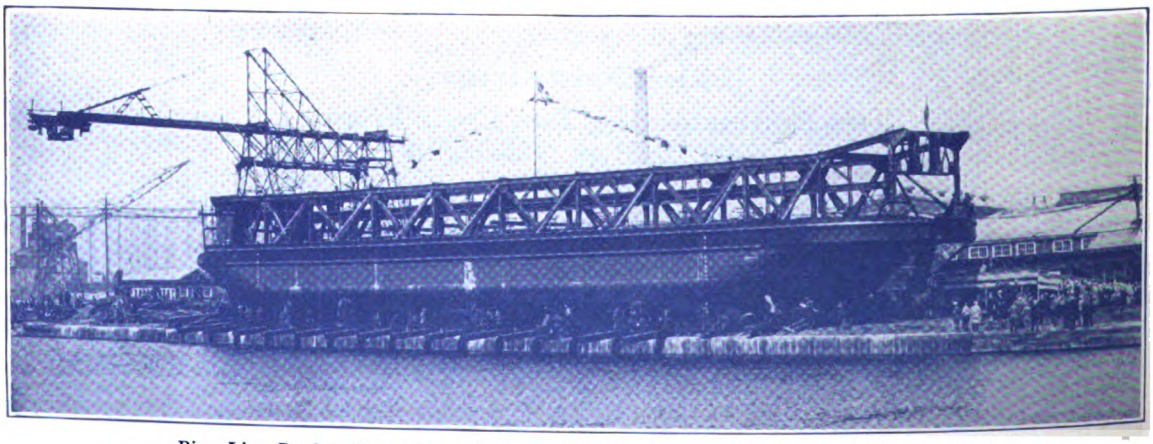
Name—NEW JERSEY; Type—Pipe line dredge
Main Drive—Diesel generators. Non self prop.
L. B. P.—Abt. 250 ft.; **Beam**—Abt. 50 ft.
Fuel Consumption—Lb. per **B. H. P. per hr.**—0.44
Generators—Four, each of 800 k. w. at 180 r. p. m. Built by General Electric. Direct connected to diesel engines described

Remarks

This vessel, built of steel of heavy scantlings, a 30-inch pipe line dredge, is the largest diesel dredge so far built. She was built at the Manitowoc Shipbuilding Corp. for the Great Lakes Dredge & Dock Co. Power for all machinery, cutter, hoist, main pump etc. is furnished by the four diesel generating units.

Some of the Large Standard Sizes of Engines Built

I. H. P.	B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A.	Height	Width	Weight
3200	2400	105	2	4—(30 x 52)	36 ft. 6 in.	28 ft. 2¾ in.	10 ft. 3 in.	.....
6400	4800	105	2	8—(30 x 52)	57 ft. 3 in.	28 ft. 2¾ in.	10 ft. 3 in.	.....
3200	2360	125	2	4—(30 x 42)	36 ft. 0 in.	25 ft. 1 in.	10 ft. 3 in.	650,000
4800	3550	125	2	6—(30 x 42)	46 ft. 0 in.	25 ft. 1 in.	10 ft. 3 in.	.....
6400	4750	125	2	8—(30 x 42)	55 ft. 0 in.	25 ft. 1 in.	10 ft. 3 in.	.....



Pipe Line Dredge New Jersey—Four Diesel Driven Generating Sets, Each 800 Kilowatts

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AS an addition to our line of heavy duty, slow speed, crosshead engines, we now build a lighter weight, higher speed, type. It is of our established 2-cycle, single-acting, trunk-piston design, requiring minimum floor space and headroom.

It is especially suitable for direct or electric drive of ferries, tugs, yachts, towboats, dredges, harbor and river craft generally; also for auxiliary service and for electric drive of large vessels.

BUSCH-SULZER

BUSCH-SULZER BROS.—DIESEL ENGINE CO.,

Two Rector St., New York | St. Louis, Mo. | Rialto Bldg., San Francisco

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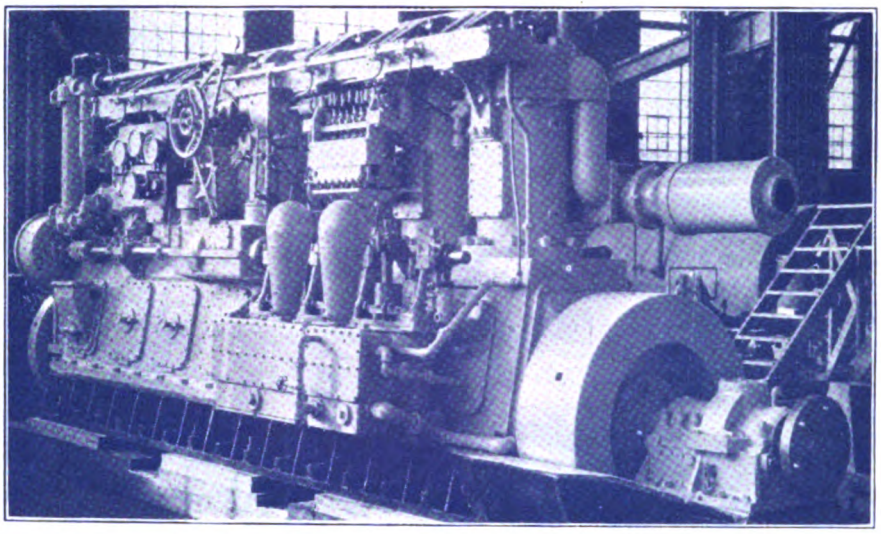
Diesel Direct Drive in Tanker Tydol

Two Engines—Each 350 B. H. P.



DESCRIPTION

Two engines of this size and type each direct connected to a separate propeller shaft are installed in the diesel tanker TYDOL. The engine is of full diesel, single acting, four cycle, air injection, trunk piston, direct reversible, marine type. It is fitted with an attached compressor of three-stage type with a capacity of 157 cubic feet per minute at 225 r. p. m.

Engine

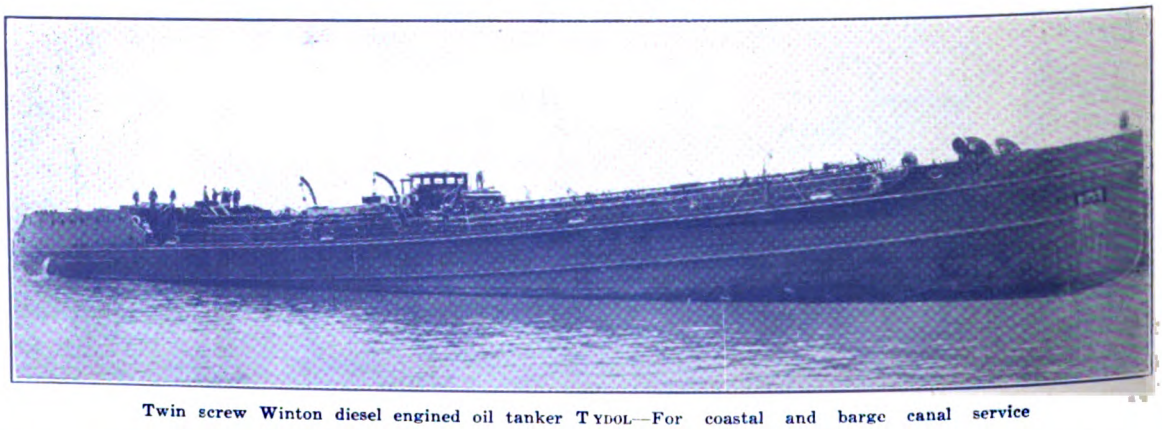
Name of Engine—Winton; **Year**—1927
Builder—The Winton Engine Co.; **Cycle**—4
No. of Cyls.—6; **B. H. P.**—350; **I. H. P.**—500
Action—Single; **Injection**—Air; **Piston Clg.**—None
Bore—14 in.; **Stroke**—18 in.; **R. P. M.**—225
Piston Speed—675 ft. p. m.; **Pressure Ind.**—109.2
Pressure Brake—76; **B. H. P. per Cyl.**—58.4
I. H. P. per Cyl.—83.3; **Mechanical Eff.**—70%
Stroke-Bore—1.29; **Working Stroke per Rev.**—3
L. O. A.—22 ft. 7¼ in.; **Hgt. O. A.**—9 ft. 1⅜ in.
Width O. A.—6 ft. 9⅜ in.; **Weight**—One engine, 67,000 lbs.; Lbs. per b. h. p.—191
Reversing—Air, sliding camshaft
Air Comp.—Attached, 3-stage, progressive type

Vessel

Name—Tydol; Built by Sun S. B. & D. D. Co. for the Tidewater Oil Co., New York
Type—Oil tanker for coastal and canal service
Main Drive—Twin screw diesel engines direct connected.
L. B. P.—252 ft.; **L. O. A.**—260 ft. 10¼ in.;
Beam—40 ft.; **Draft**—12 ft.; **Displmt.**—2755 tons
Deadwt.—1885 tons; **Speed**—10 kts.; **Propellers**—2
Fuel Consumption—Lbs. per b. h. p. per hr.—0.44; Lbs. per i. h. p. per hr.—0.31
Generators—Two of 75 k. w. each at 300 r. p. m. Winton engines; Westinghouse electrical end

Some of the Standard Sizes of Engines Built

			Single Acting				
B. H. P.	**R. P. M.**	**Cycle**	**No. Cyls.**	**L. O. A.**	**Height**	**Width**	**Weight**
100	600	4	6	11 ft. 6⅝ in.	53¾ in.	29½ in.	7,700
170	450	4	6	12 ft. ¼ in.	69¾ in.	33⅛ in.	13,000
110	450	4	4	11 ft. 4 in.	69¾ in.	33⅛ in.	9,500
300	450	4	6	14 ft. 2⅞ in.	78¼ in.	42⅝ in.	21,500
600	450	4	6	19 ft 10⅞ in.	94 in.	51 in.	38,000
800	250	4	6	26 ft. 7¼ in.	141⅝ in.	74¾ in.	110,000



Twin screw Winton diesel engined oil tanker TYDOL—For coastal and barge canal service

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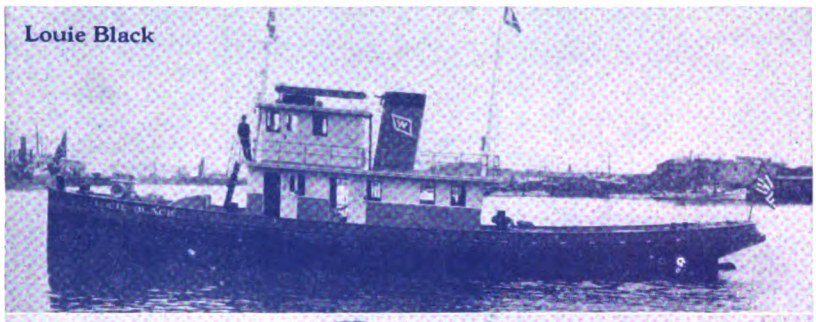
WRIGLEY TOWBOATS WINTON-POWERED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John N. Stewart

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Cleveland, Ohio

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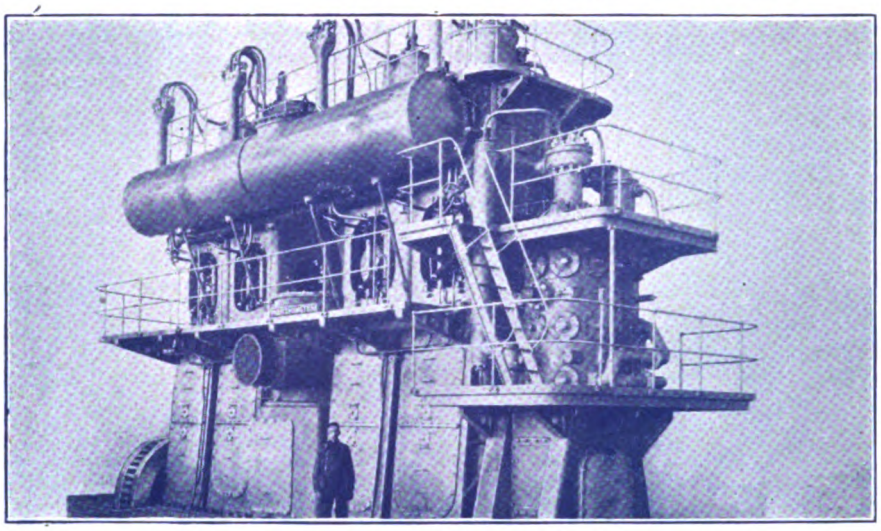
Diesel Direct Drive in Freighter Unicoi

One Double Acting Engine—2900 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to the propeller is installed in the shipping board freighter UNICOI. This engine and an exact duplicate installed in the freighter TAMPA were the first of the double acting type built in America of all-American design. It is a two cycle, slow speed, heavy duty, crosshead type, air injection engine.

Engine

Name of Engine—Worthington; **Year**—1926
Builder—Worthington Pump & Machinery Corp.
Cycle—Two; **No. of Cylinders**—4; **B. H. P.**—2900
Action—Double acting; **Injection**—Air
Scavenging—Port; **Piston Cooling**—Fresh water
Bore—28 in.; **Stroke**—40 in.; **R. P. M.**—95
Piston Speed—633.3 ft. p. m.; **Pressure Brake**—64
B. H. P. per Cyl.—725; **Stroke to Bore**—1.43
Wkg. Strokes per Rev.—8; **Lgth. O. A.**—34 ft. 6 in.
Hght. to C. L.—26 ft. 7½ in.; **Width at Base**—11 ft.
Weight—One engine, 618,000 lbs.; One engine, 213 lbs. per B. H. P.
Reversing—Direct reversing
Air Comp.—Attached, scavenging and injection

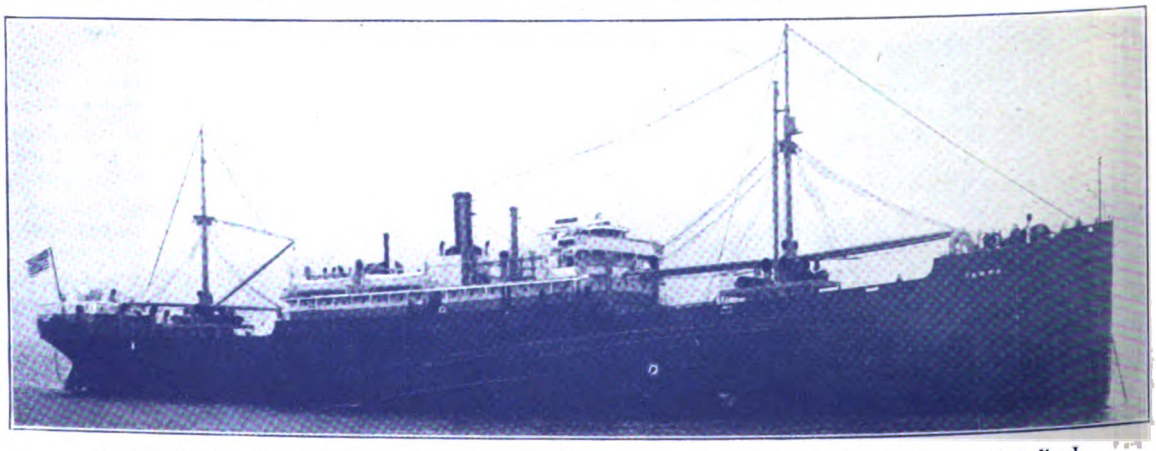
Vessel

Name—Unicoi; **Owner**—United States S. B.
Conversion—At Newport News S. B. & D. D. Co.
Type—Single screw, ocean cargo vessel
Main Drive—Direct connected diesel engine
Length B. P. P.—402 feet; **Beam**—54 feet
Depth—33 ft. 9 in.; **Draft**—26 ft. 10¾ in. (summer)
Displcmt.—13,010 tons; **Deadweight**—9,120 tons
Speed—11½ knots; **No. of Propellers**—One
Fuel Consumption—From official log of 30-day test, Lbs. per B. H. P. per hr.—0.462
Generators—Three, auxiliary direct connected to Worthington diesel engines 265 R. P. M.

Remarks

The UNICOI, originally a shipping board steam freighter of the Oscar Daniels type, was converted, as was her sister ship, the TAMPA, to diesel drive at the Newport News Shipbuilding and Drydock Co. She underwent successful sea trials on Dec. 12, 1926.

The UNICOI and the TAMPA are both engaged in the New York-Australia trade, and each is now (October, 1927) on her return voyage to America. The first voyage of the UNICOI was to Italian ports from Galveston, Texas. On her return to New York she sailed for Australian ports via the Panama canal and is returning via India and the Suez canal.



M. S. TAMPA—The UNICOI is an exact duplicate—Single screw—One 2900 H. P. double acting diesel

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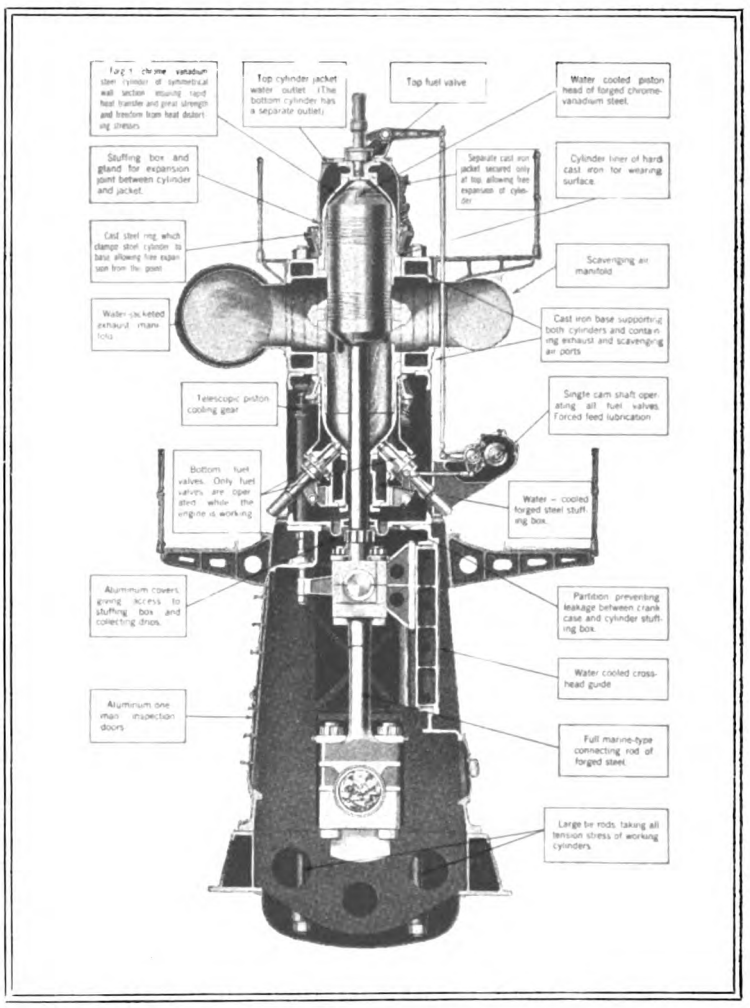
The WORTHINGTON
Double-acting, two-cycle Diesel Engine

THE principle of double action in the Diesel engine is now made practical in sizes up to 12,000 hp.

Double-action has reduced the initial cost per b.hp. by making complete use of the running gear every stroke. Thus, the purchaser does not pay for machinery running idle during one of two or four strokes.

Double-action, by successfully concentrating in one cylinder the work of four, has produced a compact engine which reduces the amount of space required per b.hp. as well as the total weight.

Double-action makes for decreased maintenance, as fewer and lighter parts are required for a given horsepower.


Top fuel valve
Water cooled piston head of forged chrome-vanadium steel.
Top cylinder jacket water outlet. (The bottom cylinder has a separate outlet.)
Stuffing box and gland for expansion joint between cylinder and jacket.
Separate cast iron jacket secured only at top, allowing free expansion of cylinder.
Cylinder liner of hard cast iron for wearing surface.
Cast steel ring which clamps steel cylinder to base allowing free expansion from the point
Scavenging air manifold
Water-jacketed exhaust manifold
Cast iron base supporting both cylinders and containing exhaust and scavenging air ports
Telescopic piston cooling gear
Single cam shaft operating all fuel valves. Forced feed lubrication
Bottom fuel valves. Only fuel valves are operated while the engine is working
Water – cooled forged steel stuffing box
Aluminum covers giving access to stuffing box and collecting drips.
Partition preventing leakage between crank case and cylinder stuffing box.
Water cooled crosshead guide
Aluminum one piece inspection doors
Full marine-type connecting rod of forged steel.
Large tie rods taking all tension stress of working cylinders.

PRODUCTS OF WORTHINGTON

PUMPS · COMPRESSORS

CONDENSERS *and* AUXILIARIES · OIL *and* GAS ENGINES

FEEDWATER HEATERS · WATER *and* OIL METERS

Literature on Request

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WORTHINGTON

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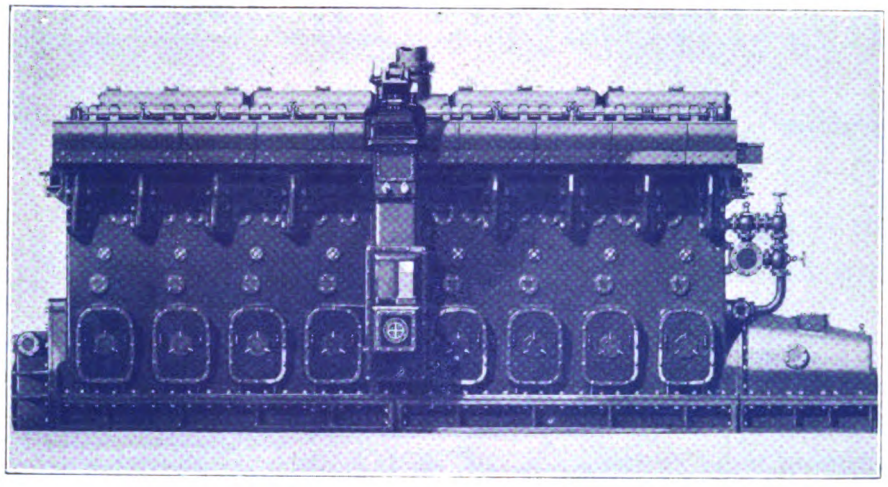
Diesel Direct Drive in Yacht Savarona II

Two Engines—Each 1500 B. H. P.



DESCRIPTION

Two engines of this size and type each direct connected to a separate propeller shaft are to be installed in the new 294-foot yacht SAVARONA II building at Pusey & Jones. The engines are of four stroke cycle full diesel with solid injection of fuel oil. The crankshaft is made of two pieces, with 12¾-inch diameter crank.

Engine

Name of Engine—Bessemer; **Year**—1927
Builder—The Bessemer Gas Engine Co.
Cycle—Four; **No. of Cylinders**—8; **I. H. P.**—1770
B. H. P.—1500; **Action**—Single; **Injection**—Solid
Piston Cooling—Air; **Bore**—18 in.; **Stroke**—22 in.
R. P. M.—300; **Pison Speed**—1101 feet p. m.
Pressure Brake—89; **B. H. P. per Cyl.**—187
I. H. P. per Cyl.—220; **Mechanical Efficiency**—85%
Length O. A.—31 ft. 2⅝ in.; **Height O. A.**—10 ft. 3¾ in.
Width—8 ft. 2¼ in.; **Wght.**—One engine 148,000 lbs.
Reversing—Direct; **Air Comp.**—None, solid injection

Vessel

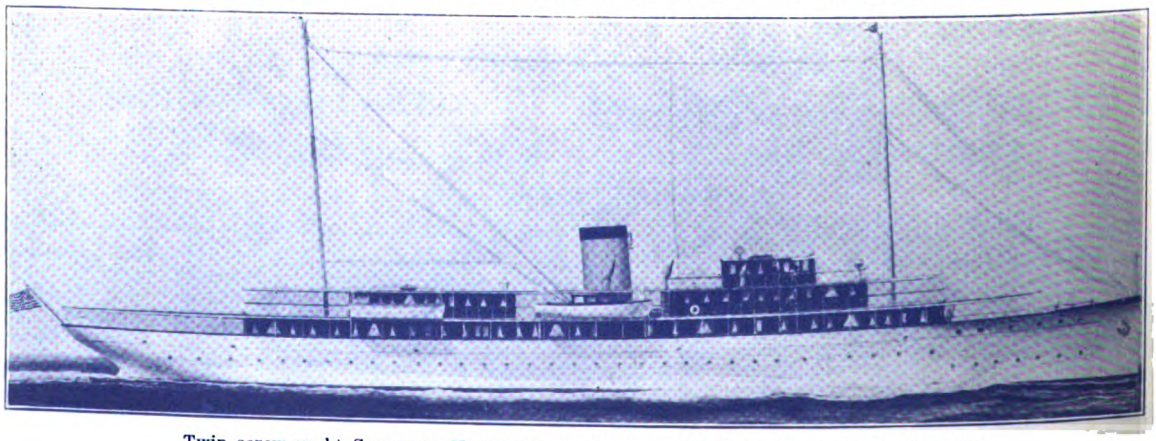
Name—Savarona II; designed by Henry J. Gielow Inc., building by Pusey & Jones, for Mrs. Richard Cadwalader
Type—Steel twin screw ocean going yacht
Main Drive—Two diesel engines direct connected
Length—294 ft.; **Beam**—38 ft.; **Draft**—16 feet
Speed—15 knots; **No. of Propellers**—Two
Fuel Consumption—Lbs. per b. h. p. per hr.—0.42
Generators—Two 110 k. w. and one 60 k. w. at 350 r. p. m. All three diesel driven.

The SAVARONA II when completed will be the largest diesel yacht in the world and will be particularly seaworthy and luxurious in appointments.

Some of the Standard Sizes of Engines Built

B. H. P.	R. P. M.	Cycle	No. Cyls.	L. O. A. inches	Height inches	Width inches	Weight
300	350	4	6	199	84	54	31,000
350	277	4	6	215	97	64	40,000
500	275	4	6	284	98	78	75,000
660	275	4	8	370	98	78	92,000
670	225	4	6	266	103	73	100,000
800	260	4	6	266	103	73	102,000
1100	300	4	6	313	124	98	120,000
1300	250	4	8	375	124	98	150,000
1500	300	4	8	375	124	98	150,000

Also a range from 125 to 230 H. P. at 400 to 300 R. P. M. All are direct reversible



Twin screw yacht SAVARONA II—Equipped with two 1500 h. p. Bessemer Diesel engines

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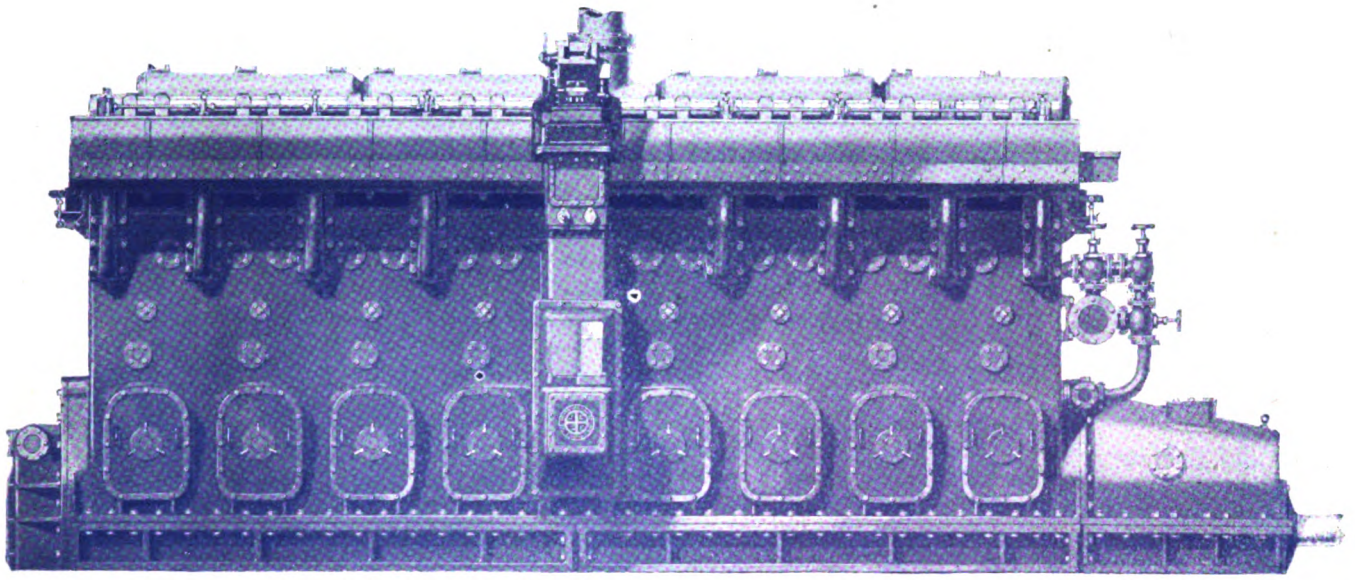

Bessemer R-Line Diesels

Outstanding in design—unmatched in performance

THE NEW R-LINE of Bessemer straight eights and sixes incorporate engineering and construction features unique in Diesel engine construction, making them unequaled for motorship service.

1. *Manoeuverability*—direct reversible—as fast, or faster, than steam in response to throttle.
2. *Flexibility*—Dual valves and exclusive engineering features give them a pick-up comparable to gasoline engines.
3. *Light Weight*—About 100 lbs. per H.P.—1500 H.P. eight cylinder engine weighs but 150,000 lbs.
4. *Reliability*—Designed along proven Diesel principles—time-tried and service tested.
5. *Accessibility*—All parts easily accessible for speedy adjustment or replacement.
6. *Quietness*—Silent chain drive to overhead camshaft—mechanical noises practically eliminated.
7. *Vibrationless*—Smooth as an automobile engine, even up to 20% overspeed.
8. *No "criticals" at any speed*—Large crank shaft and light reciprocating parts eliminate critical speeds.
9. *Compact*—Cylinders cast en-bloc—1500 H. P. 8 cyl. engines only 374 5/8" long x 123 3/4" high.

These new Bessemer Diesels are as smooth running as a motor. In feature after feature they set a new standard in marine Diesel power plants.

THE BESSEMER GAS ENGINE COMPANY
84 Lincoln Avenue : : : Grove City, Pa.

BESSEMER

DIESEL ENGINES

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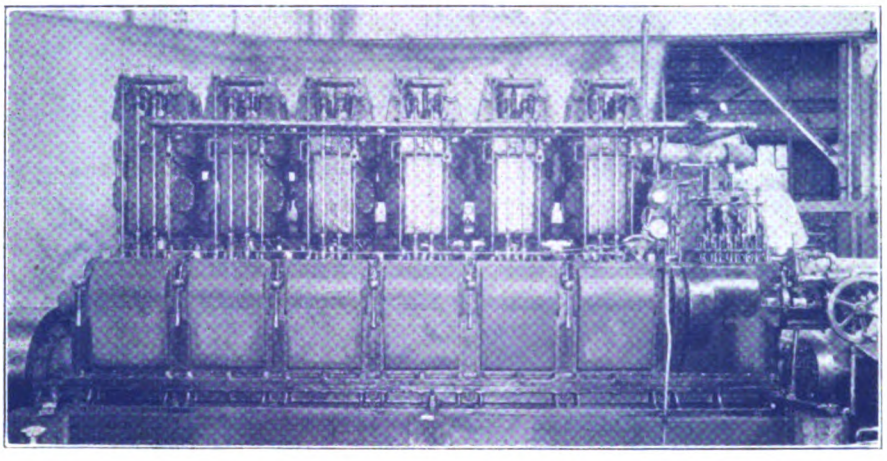
Diesel Direct Drive in Freighter Merrimac

One Engine—400 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to the propeller shaft is installed in the coastwise freighter, MERRIMAC. The engine is of full diesel, 4-cycle, solid injection, direct reversible, marine type. Reversing is done by shifting camshaft hydraulically. This engine is equipped with timken roller bearing thrust.

Engine

Name of Engine—Standard; **Year**—1927
Builder—Standard Motor Construction Co.
Cycle—4; **No. of Cylinders**—6; **B. H. P.**—400
I. H. P.—472; **Action**—Single; **Injection**—Solid
Piston Cooling—Air; **Bore**—13½ in.; **Stroke**—17 in.
R. M. P.—275; **Piston Speed**—780 ft. p. m.
Pressure Indicated—98; **Pressure Brake**—80
B. H. P. per Cyl.—66.7; **I. H. P. per Cyl.**—78
Mechanical Eff.—82%; **Stroke to Bore**—1.26
Wkg. Strokes per Rev.—3;
Weight—One engine, 56,000 lbs.; Lbs. per b. h. p. 140; Lbs. per i. h. p. 119
Reversing—Direct reversing
Air Comp.—Attached to engine; Starting air only

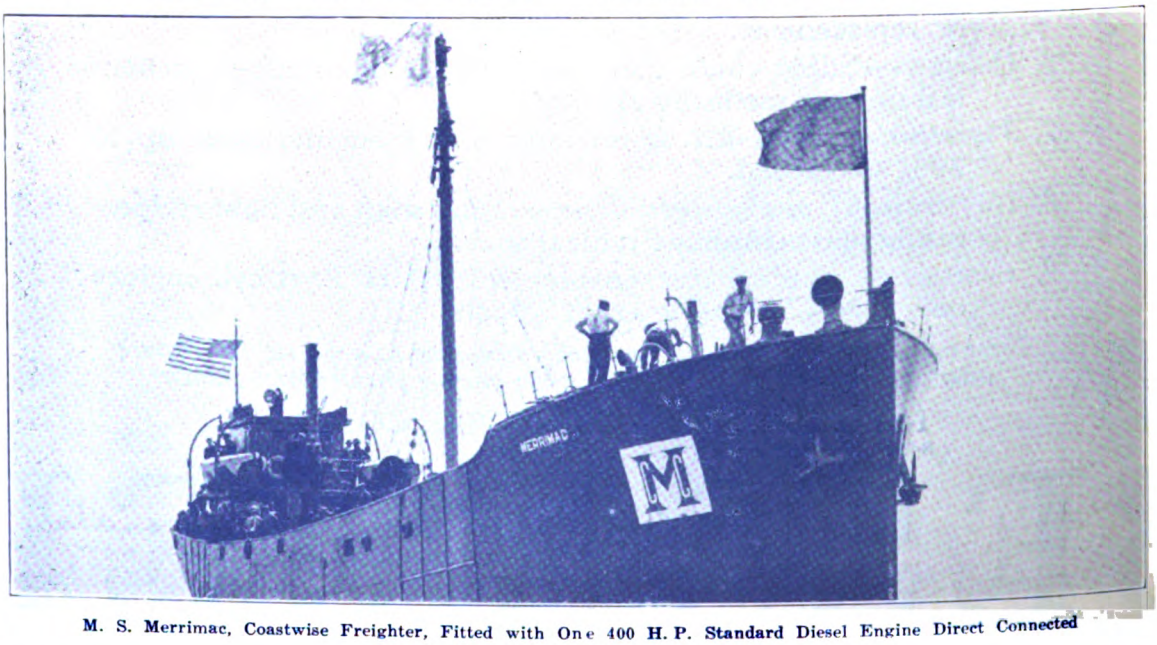
Vessel

Name—MERRIMAC; **Type**—Coastwise freighter
Main Drive—Diesel direct; **Lgth. B. P.**—144 ft.
Beam—22 ft. 8in.; **Draft**—13 ft. 3 in.
Displacement—475 tons; **Deadweight**—303 tons
Speed—10½ knots; **No. of Propellers**—one
Fuel Capacity—1200 bbls.— About 175 tons
Fuel Consumption—Lbs. per b. h. p. per hr.—0.45
Radius Without Refueling—3000 miles.

Remarks

The diesel freighter MERRIMAC is owned by the Merrimac Chemical Co., Boston, and operates between that port and Port Newark, N. J., and also Norfolk, Va., and New York. The vessel operates on a regular freight schedule for the company.

A 400-horsepower, 6-cylinder, direct reversing Standard full diesel engine is direct connected to a single propeller. Lubrication for the engine is maintained by two pumps.



M. S. Merrimac, Coastwise Freighter, Fitted with One 400 H. P. Standard Diesel Engine Direct Connected

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CONVERTED to DIESEL POWER

Powered by STANDARD 6 cyl. 400 B.H.P. Diesel Engine.

MORE and more shipowners throughout the marine industry are being converted to Diesel Power for Liners, Freighters, Tugs and Pleasure Craft.

In the STANDARD DIESEL Engine the simplicity of design, economy in the consumption of fuel and lubricating oils, the elimination of costly delays for "fueling", the reliable, smooth flow of power and the instant response to "full speed ahead" are but a few of the features which are making STANDARD DIESELS the standard of motor ship construction.

Get the facts—send for catalog.
Consultation with our Engineers
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Remember
"STANDARDS" are STANDARD!

Standard Motor Construction Co.

184 Whiton Street **Jersey City, N. J., U. S. A.**

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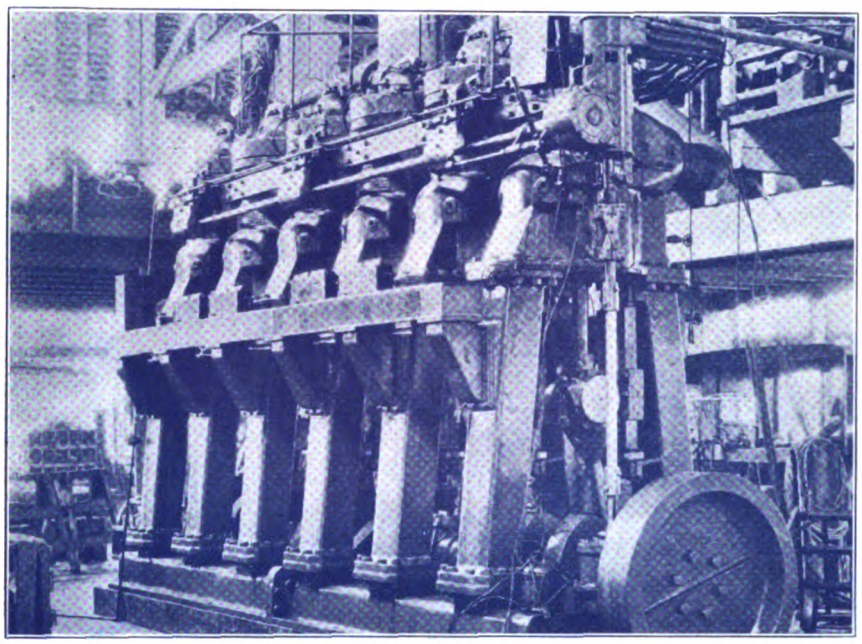
Diesel Direct Drive in Ferry Crosline

One Single Acting Engine—600 B. H. P.



DESCRIPTION

One engine of this size and type direct connected to the propeller shaft is installed in the automobile ferry CROSLINE. This engine is of the two-cycle solid injection direct reversible crosshead type of marine diesel engine. A feature of this engine is its open construction similar in this respect to the steam engine. A simple sturdy engine designed for hard service, it is also readily maneuvered.

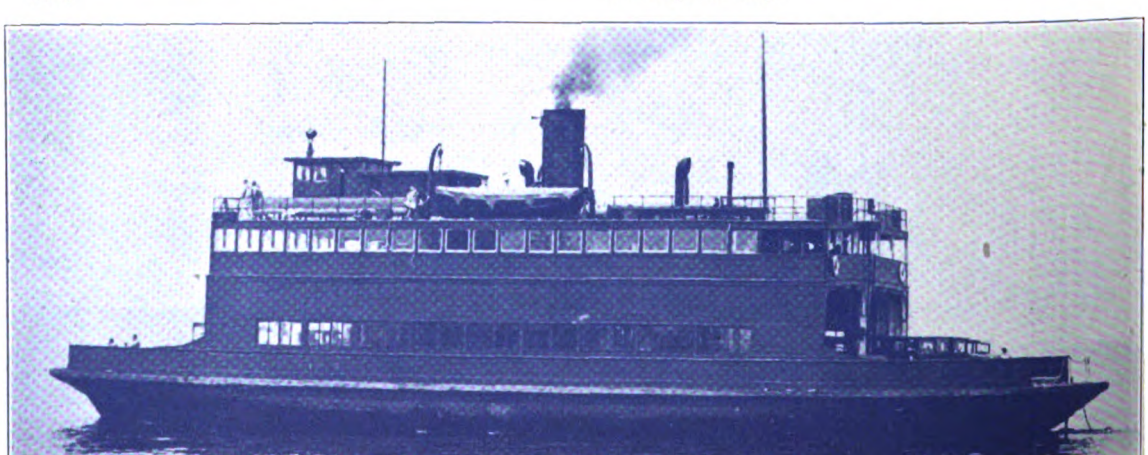
Engine

Name of Engine—Sumner-Williamette
Builder—Williamette Iron & Steel Works, Portland, Oreg.
Cycle—Two; **No. of Cylinders**—6; **I. H. P.**—750
B. H. P.—600; **Action**—Single acting, marine type
Injection—Solid; **Scavenging**—Port and attached pumps
Piston Cooling—By means of air; **R. P. M.**—175
Bore—16½ in.; **Stroke**—22 in.; **Press. Ind.**—56½
Pressure Brake—45; **B. H. P. per Cylinder**—100
I. H. P. per Cyl.—125; **Mechanical Eff.**—80%
Stroke to Bore—1.33; **Wkg. Strokes per Rev.**—6
Length—26 ft. 3 in.; **Height**—11 ft. 5 in. (To center of crank; 2 ft. 1½ in. below)
Width Over All—8 feet 0 inches
Weight—One engine, 90,000 lbs.; Lbs. per b. h. p. 150.
Reversing—Direct; **Air Comp.**—Attached

Vessel

Name—Crosline; **Type**—Wooden ferry
Length. B. P. P.—143.7 ft.; **Beam**—48 ft.
Depth—13.9 ft.; **Draft**—11 ft.; **Speed**—10½ knots
No. of Propellers—One (Single ended ferry)
Fuel Consumption—At 175 r. p. m., 22 gallons per hr. One gal, lubricating oil per 10 hours
Propeller—Three blade, 96 inches diameter, 92 inches pitch, elliptical shape 32 inches wide

This ferry runs from Alki Point to Manchester, at Seattle, a distance of 5.6 nautical miles. She backs into Manchester dock and heads into Alki. The round trip takes two hours, the actual run from port to port taking 32 minutes. The engine is started 200 times per day. This ferry has a capacity of 60 automobiles and makes 10 trips a day.



Diesel Ferry CROSLINE—single screw automobile ferry used on Puget Sound

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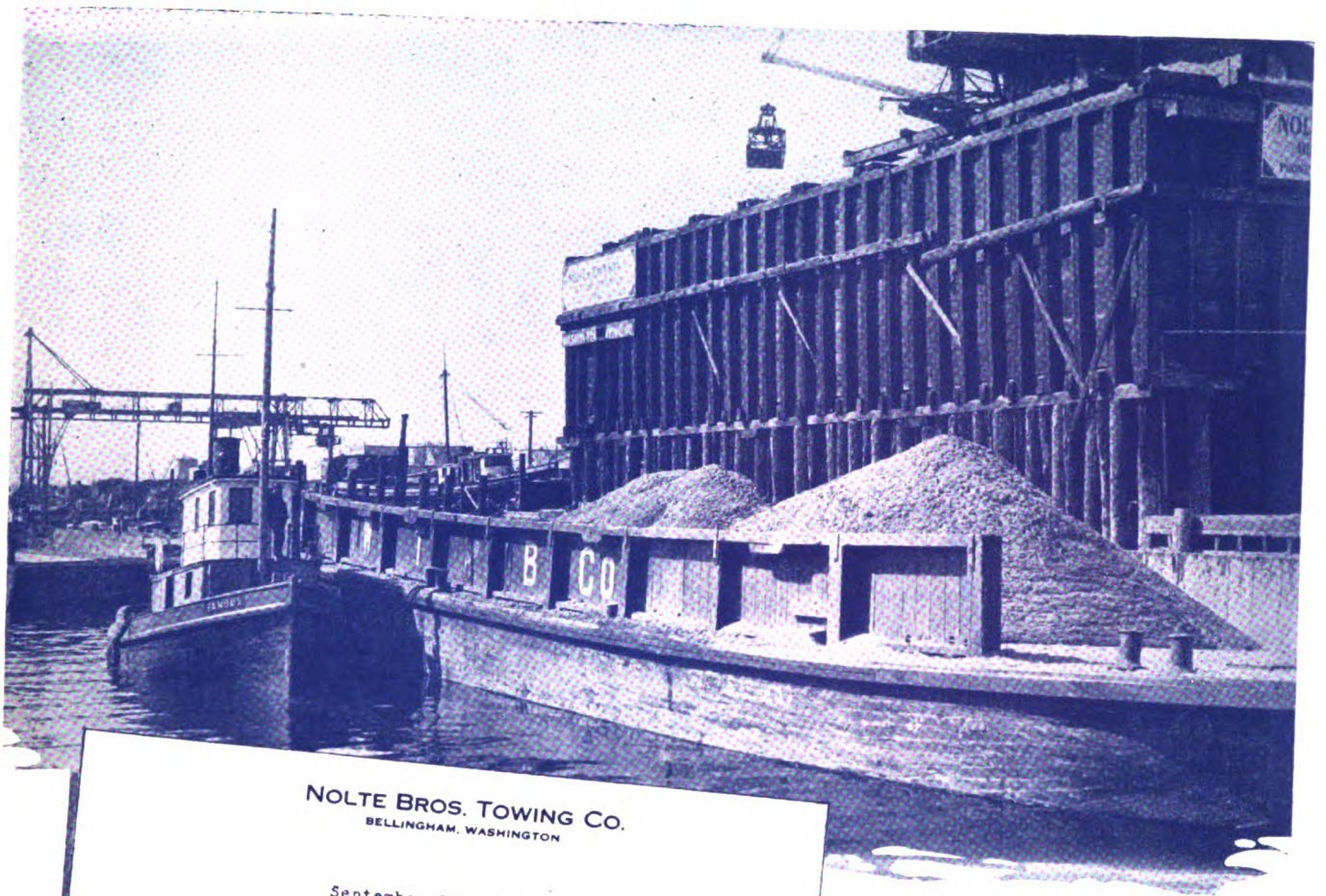


Tug "Famous", powered with 125 s.h.p. Sumner-Willamette Diesel.

NOLTE BROS. TOWING CO.
BELLINGHAM, WASHINGTON

September 24, 1927

Willamette Iron & Steel Works
Portland, Oregon.

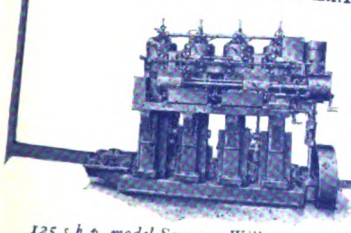
Gentlemen:

We are mailing you under separate cover, photo of the diesel tug "Famous", showing size of scow handled.

The length of this scow is 157 feet, width 38 feet and 10 foot depth, capacity of 441 tons. The average load hauled is 800 yards at an average speed of 5¼ miles per hour from Central Pits, Seattle to Bellingham, Washington.

The engine is working wonderfully well; starting instantly and running smoothly. There is a decided lack of any vibration either under load or running light.

Very truly yours,
Nolte Bros. Towing Co.
By Fred W Nolte.



125 s.h.p. model Sumner-Willamette Diesel as installed in Tug "Famous".

It will pay *you* dividends, *too!*

Compare this performance with that of any engine you own or with which you are familiar. Then write for full information regarding this proven development in Diesel design and construction.

Willamette Iron & Steel Works
Portland, Oregon, U. S. A.

SUMNER-WILLAMETTE DIESEL ENGINES

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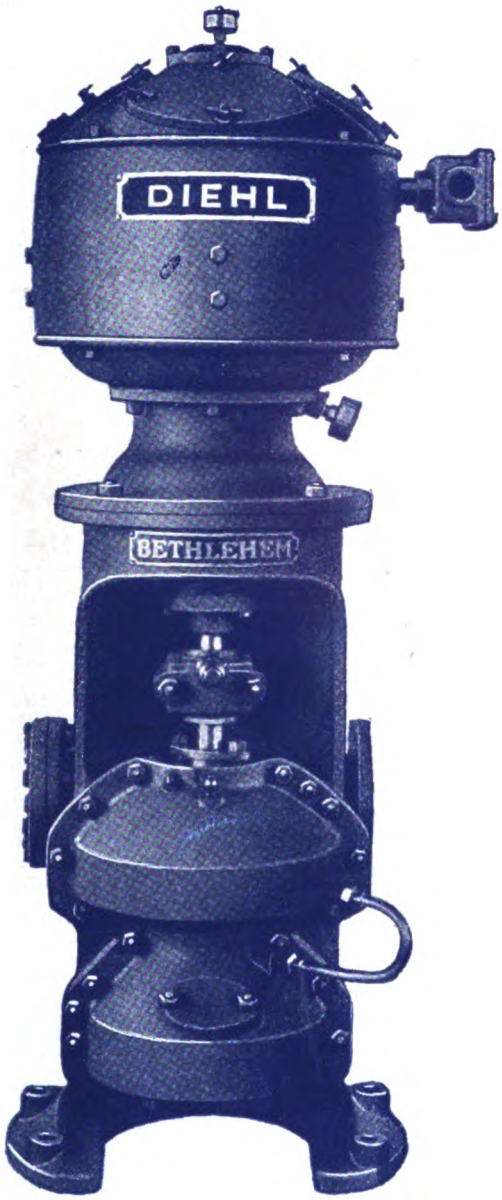

"DIEHL"

Marine Type, Enclosed, Waterproof, Vertical Motor

is used for driving "Bethlehem" No. 2 Pervac extraction pump which is to be installed in the Southern Pacific steamer, "Dixie", now building at Federal Shipbuilding & Dry Dock Company, Kearny, N. J.

This is a continuous duty motor of 8 HP at 1500 RPM; maximum capacity of pump, 75,400 pounds per hour; vacuum in condenser 28"; discharge head maximum 18 pounds per square inch.

This motor is fitted with double Timken roller thrust bearings, guaranteed to carry 3800 pounds vertical thrust up or down. Motor bearings are enclosed, dust-proof, lubricated by compression grease cups. They require attention only at long intervals.

Diehl Manufacturing Co. Elizabethport, N. J. U. S. A.

DIEHL

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Write for new Special Publication No. 1776, describing this mighty Westinghouse Diesel-electric fleet in detail.

A Mighty Fleet

Powered by Westinghouse

Diesel-electric Drive

SAILING the seven seas, the Great Lakes, and the inland waterways, is a mighty fleet propelled by Westinghouse Diesel-electric drive.

This modern armada constitutes more than half of the American-built Diesel-electric shp. and practically every class of vessel is represented, from luxurious yachts to huge tankers.

The benefits of this type of drive are so numerous and broad that naval designers have been able to solve the particular propulsion problems of each class of vessel to great advantage through Westinghouse Diesel-electric drive.

Westinghouse Electric & Manufacturing Company
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Sales Offices in All Principal American Cities
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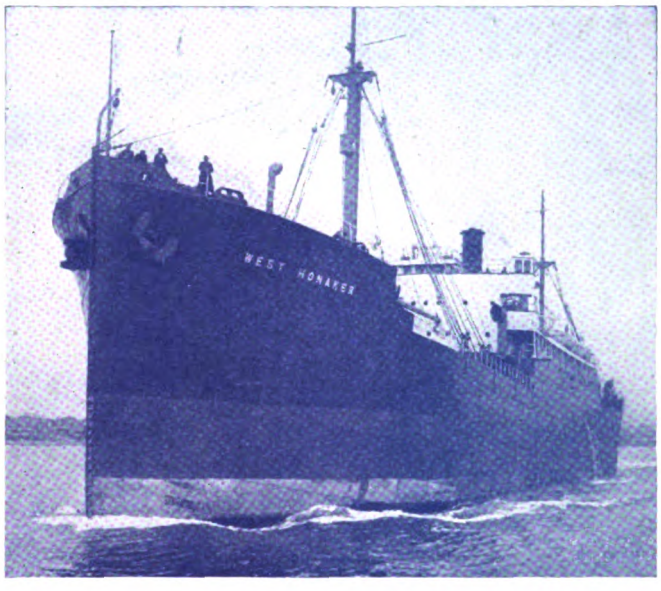

One of the reconditioned vessels of the U. S. Shipping Board in which HASKELITE was used for the ship joiner work.

The Shipping Board converted to Diesel and Modernized with HASKELITE

IN the $25,000,000 steam-to-Diesel conversion and reconditioning program of the United States Shipping Board, HASKELITE has played a prominent part. In eleven vessels, already in service or being reconditioned, HASKELITE is used exclusively for bulkheads.

Modern marine construction calls for HASKELITE bulkheads and panelling. This blood-glue plywood saves space, often enough for an additional stateroom, is stronger than the usual bulkhead construction, takes a beautiful natural hardwood finish, and cuts ship-joiner costs through savings in time and labor and minimizing of waste. PLYMETL, its steel-surfaced companion, for the above uses and for doors, has all these advantages plus the fire-retarding qualities of its tough metal surface.

The blueprint booklet of marine applications of these products is interesting reading for shipbuilders and operators. Write for it.

PLYWOOD
HASKELITE
PLYMETL

HASKELITE MANUFACTURING CORPORATION

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Gas~and Danger? or a clean tank, sludge all gone, and *not a trace of gas?* Safe! for a gas free tank never explodes.
THIS is one of the tanks in the S. S. "Cities Service Fuel" cleaned by us in June and certified gas free as follows:
9 Cargo Tanks Port and Starboard 18
4 Summer Tanks " " " 8
6 Double Bottom " " " 12
Aft Bunker Tanks " " " 2
Pump Rooms " " " 2
Pump Room Wing Spaces 2
Fore Peak Tank 1
Space Around Water Tanks 1
Total Tanks Cleaned 46
Total Working Time, Start to Finish 52 Hours
Wheeler System
Salvage Process Corporation
224 Bush Street Brooklyn, N. Y.
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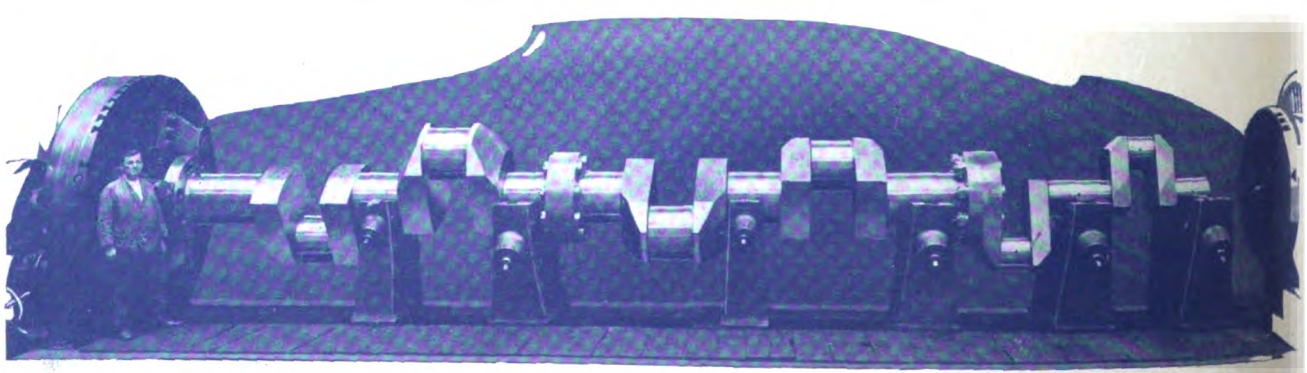
THE illustration below shows a forged steel crankshaft delivered to this country by SKODAWORKS for use in a Marine Diesel Engine. Crankshafts, Stems, Stern Posts, Propeller Brackets, Rudders, Anchors, etc.—which must withstand unusual strain and for which the highest quality of material and workmanship is essential — are manufactured by SKODAWORKS and delivered to any part of the United States with a decided saving in time and money. This is particularly true for finished steel parts of exceptional size or of an unusually difficult nature.

SKODAWORKS

ARTHUR J. HERSCHMANN, M. E. 50 Church St., New York City



Made at SKODAWORKS for delivery to the United States

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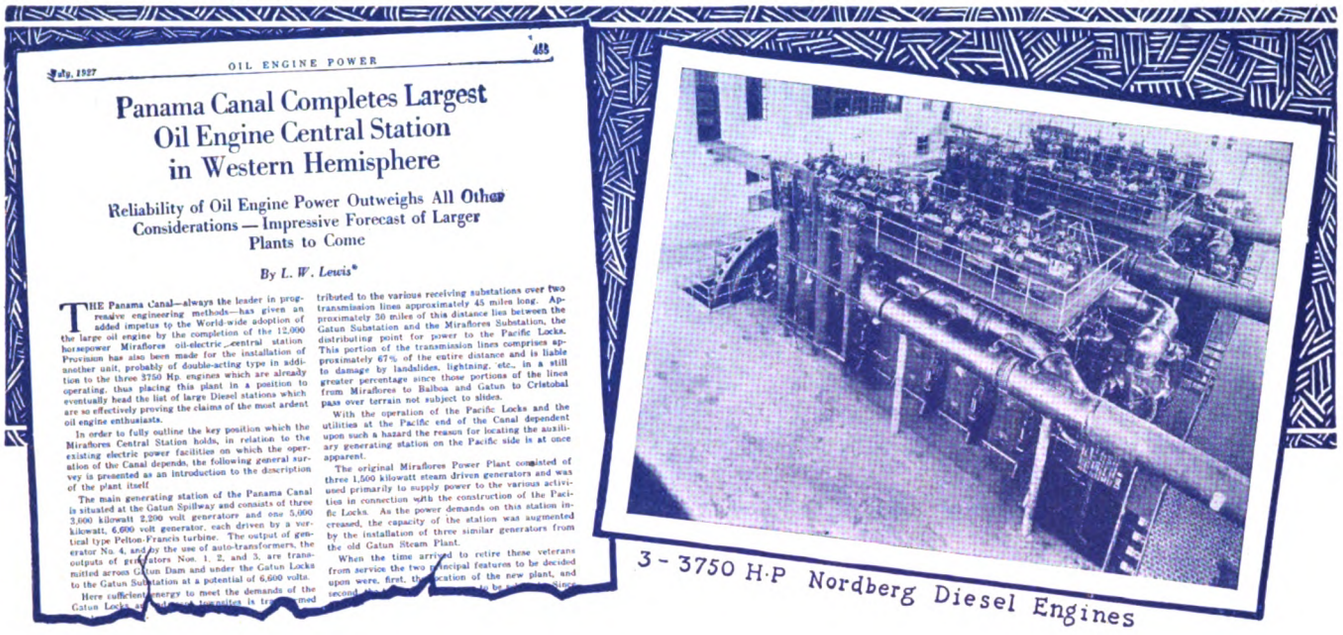


July, 1927 OIL ENGINE POWER 483

Panama Canal Completes Largest Oil Engine Central Station in Western Hemisphere

Reliability of Oil Engine Power Outweighs All Other Considerations — Impressive Forecast of Larger Plants to Come

By L. W. Lewis*

THE Panama Canal—always the leader in progressive engineering methods—has given an added impetus to the World-wide adoption of the large oil engine by the completion of the 12,000 horsepower Miraflores oil-electric central station. Provision has also been made for the installation of another unit, probably of double-acting type in addition to the three 3750 Hp. engines which are already operating, thus placing this plant in a position to eventually head the list of large Diesel stations which are so effectively proving the claims of the most ardent oil engine enthusiasts.

In order to fully outline the key position which the Miraflores Central Station holds, in relation to the existing electric power facilities on which the operation of the Canal depends, the following general survey is presented as an introduction to the description of the plant itself.

The main generating station of the Panama Canal is situated at the Gatun Spillway and consists of three 3,000 kilowatt 2,200 volt generators and one 5,000 kilowatt, 6,600 volt generator, each driven by a vertical type Pelton-Francis turbine. The output of generator No. 4, and by the use of auto-transformers, the outputs of generators Nos. 1, 2, and 3, are transmitted across Gatun Dam and under the Gatun Locks to the Gatun Substation at a potential of 6,600 volts.

Here sufficient energy to meet the demands of the Gatun Locks [illegible] is transformed

tributed to the various receiving substations over two transmission lines approximately 45 miles long. Approximately 30 miles of this distance lies between the Gatun Substation and the Miraflores Substation, the distributing point for power to the Pacific Locks. This portion of the transmission lines comprises approximately 67% of the entire distance and is liable to damage by landslides, lightning, etc., in a still greater percentage since those portions of the lines from Miraflores to Balboa and Gatun to Cristobal pass over terrain not subject to slides.

With the operation of the Pacific Locks and the utilities at the Pacific end of the Canal dependent upon such a hazard the reason for locating the auxiliary generating station on the Pacific side is at once apparent.

The original Miraflores Power Plant consisted of three 1,500 kilowatt steam driven generators and was used primarily to supply power to the various activities in connection with the construction of the Pacific Locks. As the power demands on this station increased, the capacity of the station was augmented by the installation of three similar generators from the old Gatun Steam Plant.

When the time arrived to retire these veterans from service the two principal features to be decided upon were, first, the location of the new plant, and second, [illegible]

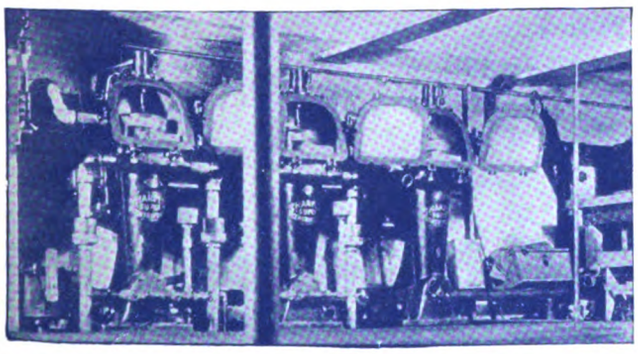
3 - 3750 H·P Nordberg Diesel Engines

America's Greatest Diesel Plant

Protected by Sharples Oil Clarifiers

The new Miraflores Central Station on the Panama Canal—America's largest Diesel plant—demands dependable, unfailing engine performance.

Says Mr. Lewis*: "The Panama Canal is more dependent on its power plant than any municipality could possibly be. The entire complex system of locks, electric towing railways and the operation of the Canal fortifications are essentially based on an uninterrupted and absolutely reliable electric power system. Not only the normal peacetime operation of the Canal, but also its security in time of war, place an unusual emphasis on the continuity of operation. The selection of oil engines to serve under such circumstances, far more rigorous than virtually any other power plant duty, is doing more to definitely establish the position of the oil engine than any amount of "theoretical" consideration could possibly accomplish." *(*Asst. Eng'r. Dep't. of Operation and Maintenance, Panama Canal.)*



Three Sharples Presurtite Fuel Oil Clarifiers (shown here) and three Sharples Open Type Lubricating Oil Clarifiers assure unusually dependable protection for the uninterrupted operation of this great plant.

THE SHARPLES SPECIALTY COMPANY, 2338 WESTMORELAND STREET, PHILADELPHIA. Boston, New York, Pittsburgh, Chicago, Detroit, Tulsa, New Orleans, San Francisco, Los Angeles, Seattle, Toronto. Super Centrifugal Engineers, Ltd., Aldwych House, London, W.C. 2, England; Ste. Ame. Des Appareils Centrifuges, Rueil (Seine-et-Oise) 70, Rue Du Vieux—Pont, Paris, France; Tatsumi Commercial Corporation, Marine Insurance Building, Tokio, Japan.

VISIT BOOTH 92 AT THE NEW YORK POWER SHOW

If you visit the New York Power Show—December 5th to 10th—be sure to see the interesting display of Sharples Super Centrifuges at Booth 92, and learn about the remarkable economies they effect in everyday operation.

SHARPLES

A GREAT FORCE

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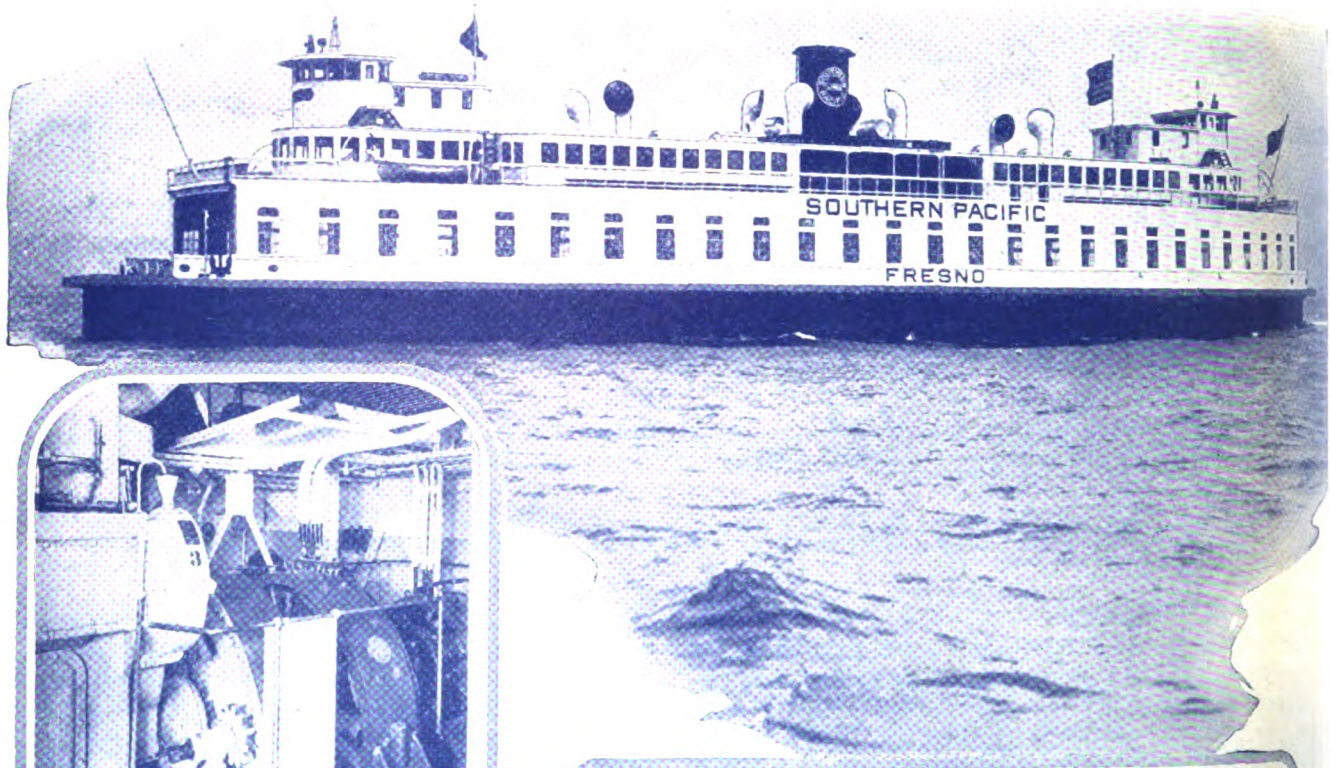
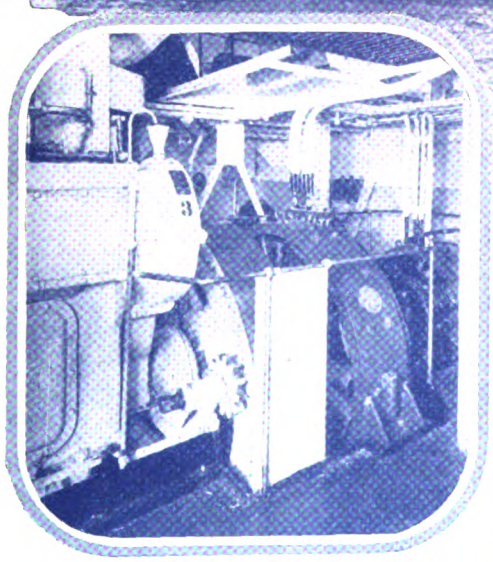
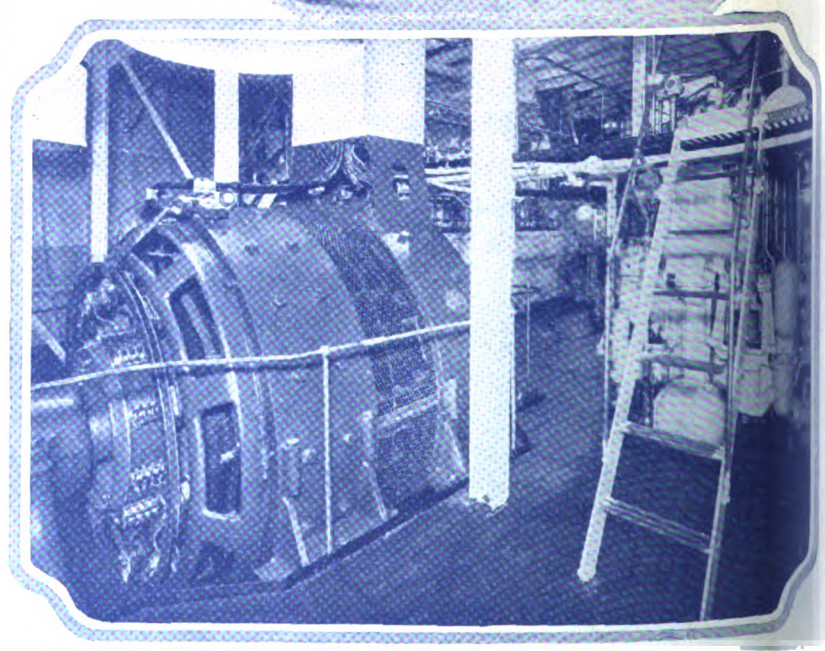
Diesel-electric propulsion—





One of the four main generators and auxiliary generators on the FRESNO.



View of one of the two double-armature, main propulsion motors.

Seven years ago the first Diesel-electric ship was placed in service in this country. Since that time, 68 other Diesel-electric vessels have been commissioned or are under construction. The contributions that General Electric has made to the perfection and application of this superior form of drive are largely responsible for this impressive record.

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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of the modern ferryboat drive

Chosen for the Southern Pacific and Northwestern Pacific Ferryboats *Fresno, Stockton, Santa Rosa,* and *Mendocino.*

It took less than a day to demonstrate the superiority of the new Southern Pacific Diesel-electric ferryboat *Fresno*. Her capacity for automobiles fairly astonished operating men, for Diesel-electric construction has provided a spacious main deck practically free of obstructions.

The *Fresno* is the first of six Diesel-electric ferryboats built for the Southern Pacific and Northwestern Pacific for operation in San Francisco bay. Four are completely electrified by General Electric.

One of the most important advantages of G-E Diesel-electric drive is the increased maneuvering ability which it affords. It has also solved the difficult problem presented in double-ended operation by simplifying concentration of the available power on the propeller that is actually driving the ship.

These advantages, with the operating economies and flexibility that are inherent qualities of this equipment, explain the increasing preference of operating men for G-E Diesel-electric—the modern drive.

The spaciousness and freedom from obstructions of the main deck are clearly shown. This also illustrates the effectiveness of correct lighting with MAZDA lamps.

GENERAL ELECTRIC 123-10

SALES OFFICES IN PRINCIPAL CITIES

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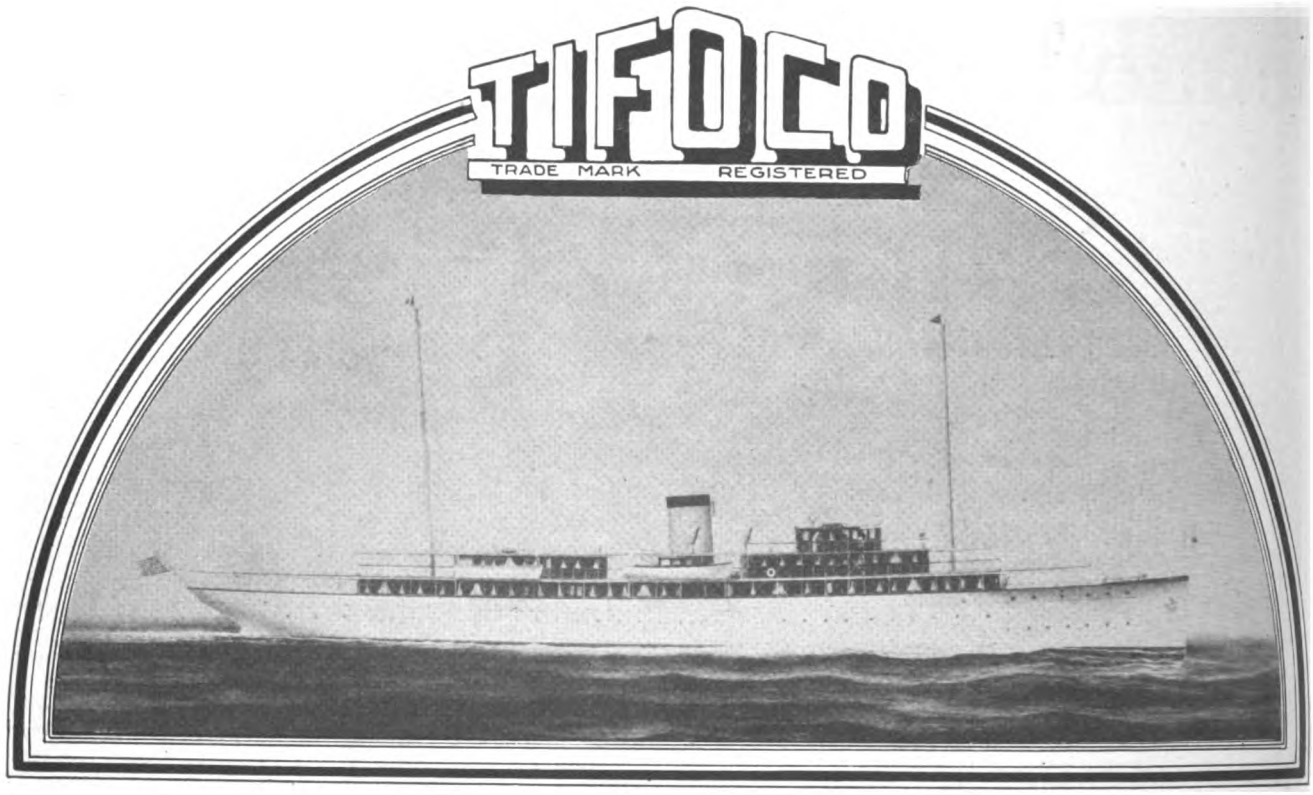
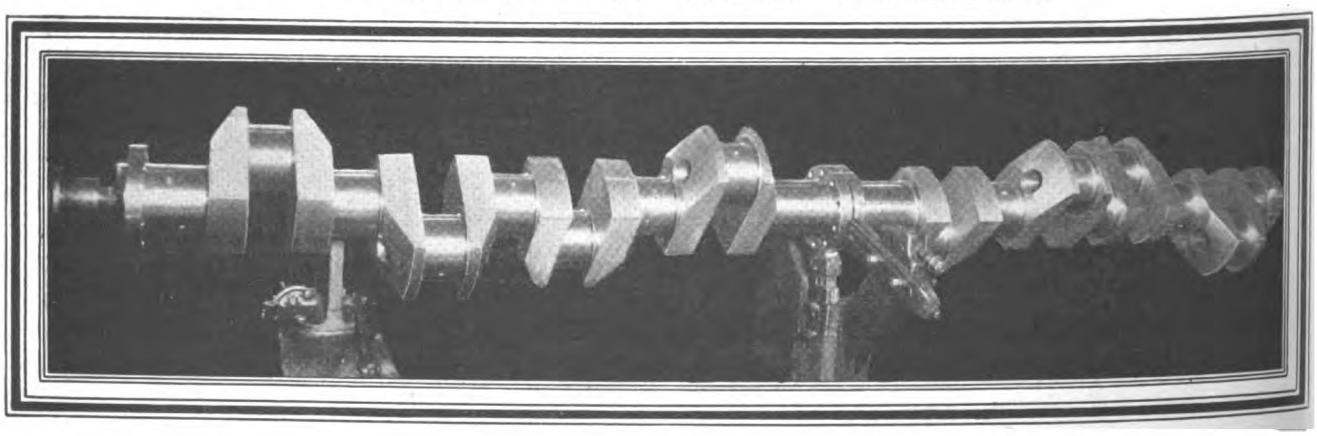


Tifoco Crankshafts for the Largest Yacht in the World



FOUR sections of four-throw crankshafts were furnished for the two 1500 Hp. Bessemer Diesel Engines which are to be installed in the world's largest Diesel Yacht now being built at Pusey & Jones yard at Wilmington, Del., a yacht which is 294' long with 38' beam.

These crankshafts were finished complete at Titusville, were forged under a 1500-ton Hydraulic Forging Press and inspection made showed the shafts did not vary over .001" from specifications. The pins were parallel with the journals within .001" and each completed crankshaft weighed approximately nine tons. Experience, capacity, equipment plus a real desire to produce the finest crankshafts is what Tifoco offers the Diesel Engine Industry.

TITUSVILLE FORGE COMPANY, Titusville, Pa.

Sales Offices

New York—120 Broadway
Chicago—80 East Jackson Blvd.
Los Angeles—1118 Santa Fe Ave.
San Francisco—Monadnock Bldg.
Milwaukee—First Wisconsin Nat. Bank Bldg.
Pittsburgh—Park Building
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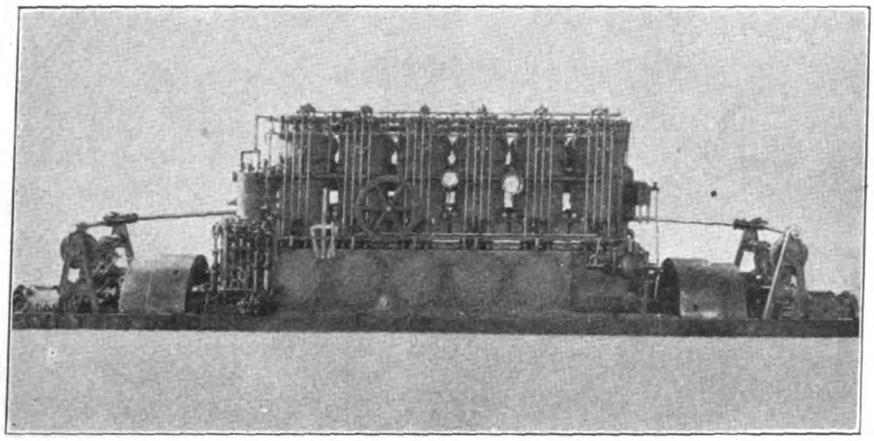
Diesel Direct Drive in Ferry Multnomah

One Engine—250 B. H. P.



DESCRIPTION

The double ended ferryboat MULTNOMAH is equipped with one engine of this size and power. Owing to logs, snags, etc., encountered during winter months, the engine is built with clutches fore and aft connecting with a propeller on each end. The engine is direct reversible and it is therefore possible to operate with the one propeller

Engine

Name of Engine—Atlas-Imperial; **Year**—1927
Builder—Atlas Imperial Engine Co.; **Cycle**—4
No. of Cylinders—6; **B. H. P.**—250; **Action**—Single
Injection—Mechanical, solid; **Scavenging**—None
Piston Cooling—No; **Bore**—11 in.; **Stroke**—15 in.
R. P. M.—275; **Piston Speed**—687 ft. per minute
B. H. P. per Cyl.—42; **Stroke to Bore**—1.36
Reversing—Direct reversing

Vessel

Name—Multnomah; **Type**—Double ended ferry
Main Drive—Direct diesel, screw at each end
Length B. P. P.—146 ft.; **Beam**—44 ft.
Depth—10 ft. 7 in.; **Draft**—6 ft. 6 in.
No. of Propellers—Two, one at each end
Fuel Consumption—Lbs. per b. h. p. per hr.—0.4

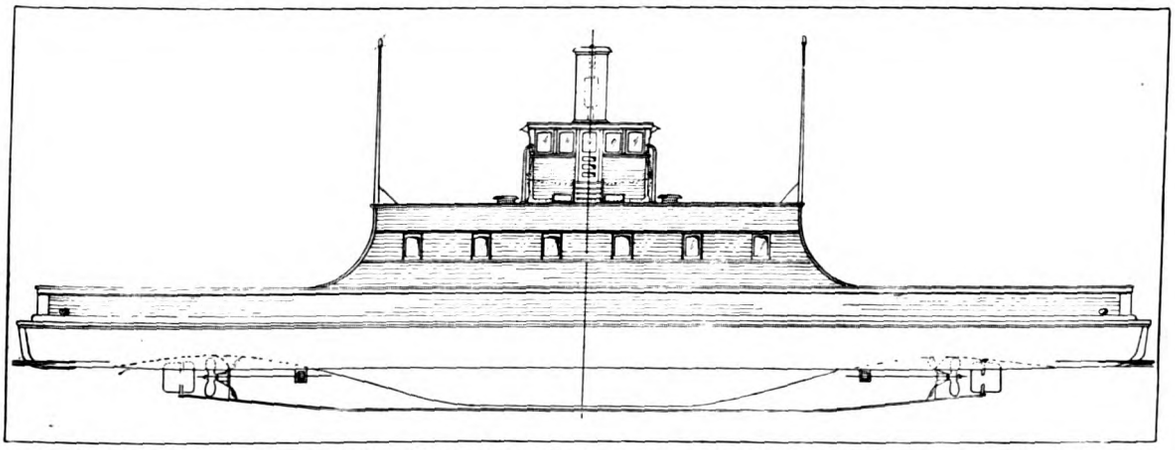
Remarks

This double end ferry boat has just been completed for the county of Multnomah, Oreg., and is to operate as a ferry at Portland, Oreg., on 24-hour service.

Due to shallow draft requirements the propellers operate in tunnels.

Some of the Standard Sizes of Engines Built

B. H. P.	R. P. M.	Cycle	No. of Cyl.	Cylinder Diameter	Stroke	Net Weight
100	300	4	3	10 in.	13 in.	16,000
150	275	4	3	12 in.	16 in.	27,300
110	325	4	4	9 in.	12 in.	14,700
135	300	4	4	10 in.	13 in.	18,100
165	275	4	4	11 in.	15 in.	27,500
200	275	4	4	12 in.	16 in.	31,000
120	400	4	6	7½ in.	10½ in.	12,000
140	325	4	6	8½ in.	12 in.	17,640
180	300	4	6	9½ in.	13 in.	23,000
200	300	4	6	10 in.	13 in.	24,000
250	275	4	6	11 in.	15 in.	37,500
300	275	4	6	12 in.	16 in.	42,000
400	250	4	6	14 in.	18 in.	61,000



Double ended diesel ferry MULTNOMAH—One 250 B. H. P. diesel engine clutch connected to propeller at each end

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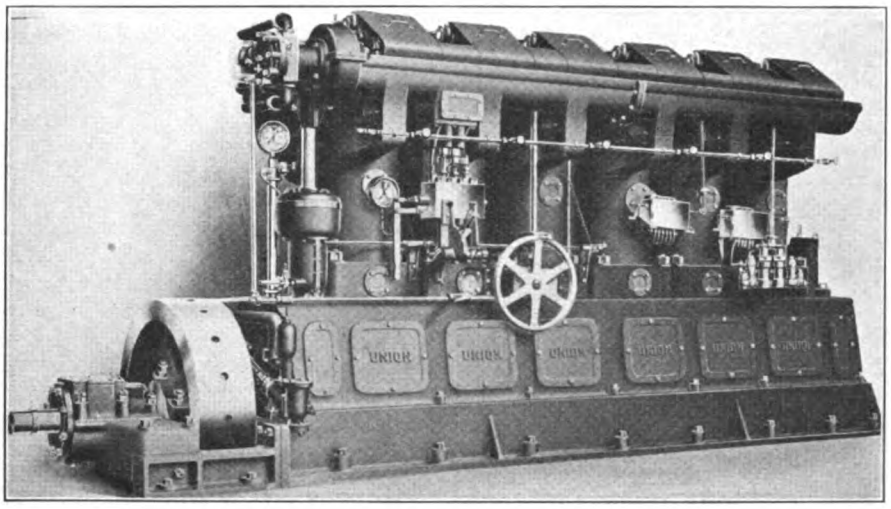
Diesel Direct Drive in Fishing Boat Del Monte

One Engine—225 B. H. P.



DESCRIPTION

One engine of this size and type is installed in the fishing boat DEL MONTE. It is of four cycle, trunk piston, direct reversible, airless injection, single acting type. A feature of the design is the overhead comshaft construction giving uniform period of opening for the mechanically operated fuel valve. Fuel injection valves are located in the center of the cylinder head.

Engine

Name of Engine—Union; **Year**—1927
Builder—Union Gas Engine Co.; **Cycle**—4
No. of Cylinders—6; **B. H. P.**—225; **I. H. P.**—290
Action—Single; **Injection**—Mechanical (solid)
Piston Cooling—No; **Bore**—10½ in.; **Stroke**—15 in.
R. P. M.—280; **Piston Speed**—700 feet per min.
Pressure Indicated—105; **Pressure Brake**—81.6
B. H. P. per Cyl.—37.5; **I. H. P. per Cyl.**—48.3
Mechanical Efficiency—78%; **Stroke to Bore**—1.43
Wkg. Strokes per Rev.—3; **Lgth. O. A.**—16 ft. 4 in.
Hght. O. A.—8 ft. 0 in.; **Width O. A.**—54 in.
Weight—One engine 34,550 lbs.; Lbs. per b. h. p —154; Lbs. per I. H. P.—119.5
Reversing—Direct; **Air Comp.**—For starting air

Vessel

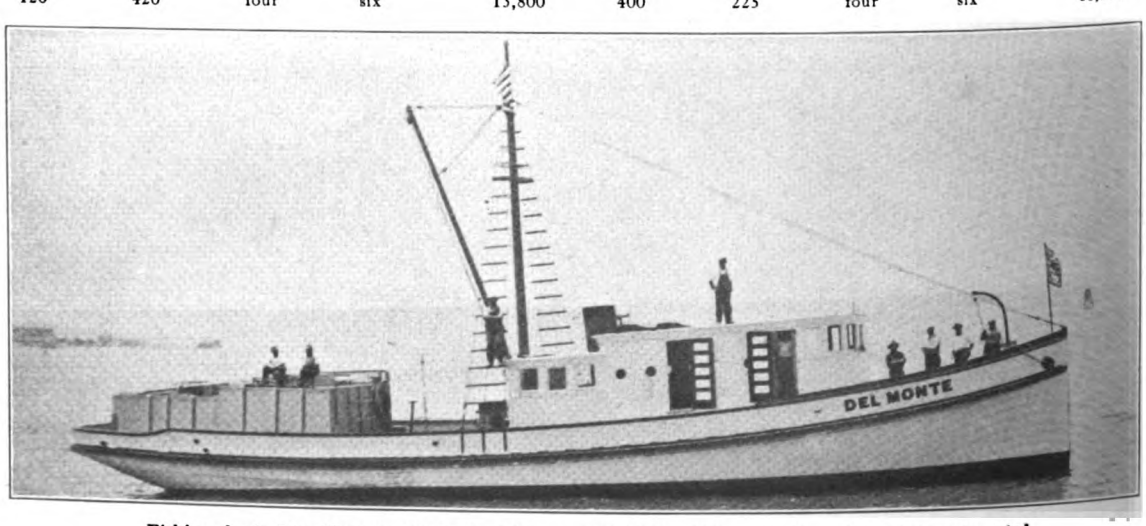
Name—Del Monte; **Type**—Fishing boat
Main Drive—One diesel engine direct connected
Length O. A.—86 ft. 0 in.; **Beam**—21 ft. 6 in.
Draft—8 ft. 6 in.; **Deadweight**—125 tons
Speed—10½ knots; **No. of Propellers**—One
Fuel Capacity—100 barrels or 14 tons
Fuel Consumption—Lbs. per b. h. p. per hr.—0.43; Tons per day—1.04; Radius without refueling—4000 miles

Remarks

The DEL MONTE is an able seaworthy, wooden vessel used in tuna and sardine fishing off the coast of Mexico with San Diego as headquarters.

Some Standard Sizes of Engines Built

B.H.P.	R.P.M.	Cycle	No. Cyl.	Weight	B.H.P.	R.P.M.	Cycle	No. Cyl.	Weight
110	280	four	three	22,200	150	330	four	six	20,900
150	0	four	four	27,200	225	280	four	six	34,550
0	260	four	four	36,500	300	260	four	six	46,800
120	420	four	six	13,800	400	225	four	six	66,500



Fishing boat DEL MONTE equipped with one 225 H. P. Union diesel engine direct connected

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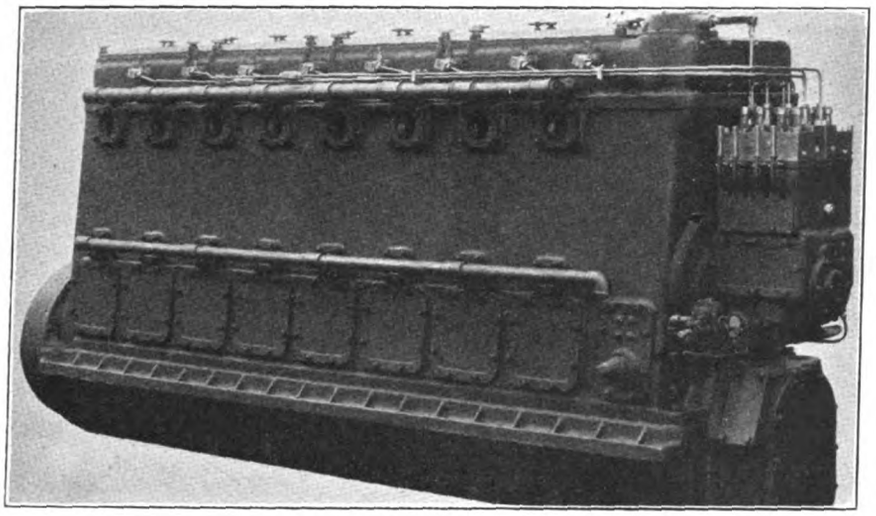
Diesel Direct Drive in Twin Screw Yacht Samona

Two Engines—Each 265 B. H. P.



DESCRIPTION

Two engines of this size and type, direct connected to separate propeller shafts are installed in the diesel yacht SAMONA. The engine is a full diesel, four cycle, solid injection, completely enclosed, marine type. Lubrication by pressure feed is carried to all bearings and other parts. The system is automatic, centrally controlled and indicated.

Engine

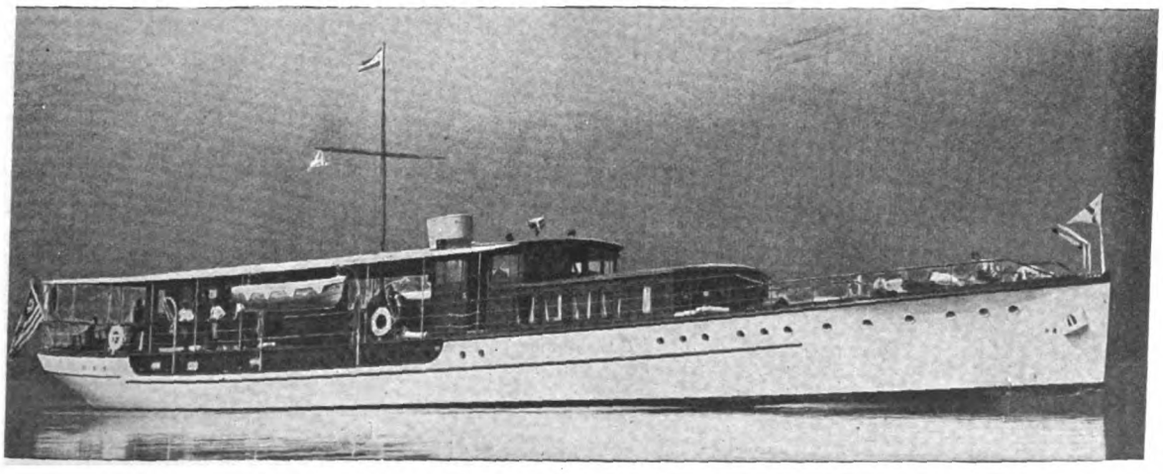
Name of Engine—Foos Type L.; **Year**—1927
Builder—The Foos Engine Co.; **Cycle**—4
No. of Cyls.—8; **B. H. P.**—265; **I. H. P.**—320
Action—Single; **Injection**—Solid; **Pist. Coolg.**—No
Bore—8½ in.; **Stroke**—11 in.; **R. P. M.**—600
Piston Speed—1100 ft. p. m.; **Press. Ind.**—85
Pressure Brake—70; **B. H. P. per Cyl.**—33
I. H. P. per Cyl.—40; **Mechanical Eff.**—82%
Stroke-Bore—1.27; **Working Strokes per Rev.**—4
L. O. A.—15 ft. 1¾ in.; **Height O. A.**—6 ft. 6 in.; Above floor line, 5 ft. 6 in.; **Width O. A.**—52 in.
Weight—One engine, 21,00 lbs. including clutch, thrust bearing, air compression, fuel and water pumps; Lbs. per b.h.p.—79; Lbs. per i.h.p.—65½
Reversing—Direct, by sliding camshaft
Air Compressor—Direct connected single acting

Vessel

Name—Samona; **Built** by N. J. Blanchard Boat Co. in 1923. Altered to twin screw in 1927
Type—Yacht, wood, ocean going
Main Drive—Twin screw diesel, direct connected
Length O. A.—115 ft.; **Beam**—17 ft. 10 in.
Depth—7 ft. 11 in.; **Draft**—6 ft.; **Speed**—13½ kts.

Remarks

The yacht SAMONA was designed by L. E. Geary and was built at Seattle, 1923, by the N. J. Blanchard Boat Co. The vessel, built of wood, originally came out with triple screws driven by diesel engines of 100 horsepower each. In 1927 it was decided to change this yacht to twin screw. It was finally decided to install two 8-cylinder type L, completely enclosed, high speed Foos diesel engines, each of 265 brake horsepower at 600 revolutions per minute. In Lloyd's register of American yachts the owner of the SAMONA is listed as W. J. Hole, a rancher of Arlington, Calif. An interesting feature of this yacht is the rosewood finish which was sawed from seven large logs shipped to Seattle from Honduras especially for this job.



Twin screw yacht SAMONA—Equipped with two 265 H. P. high speed Foos diesel engines

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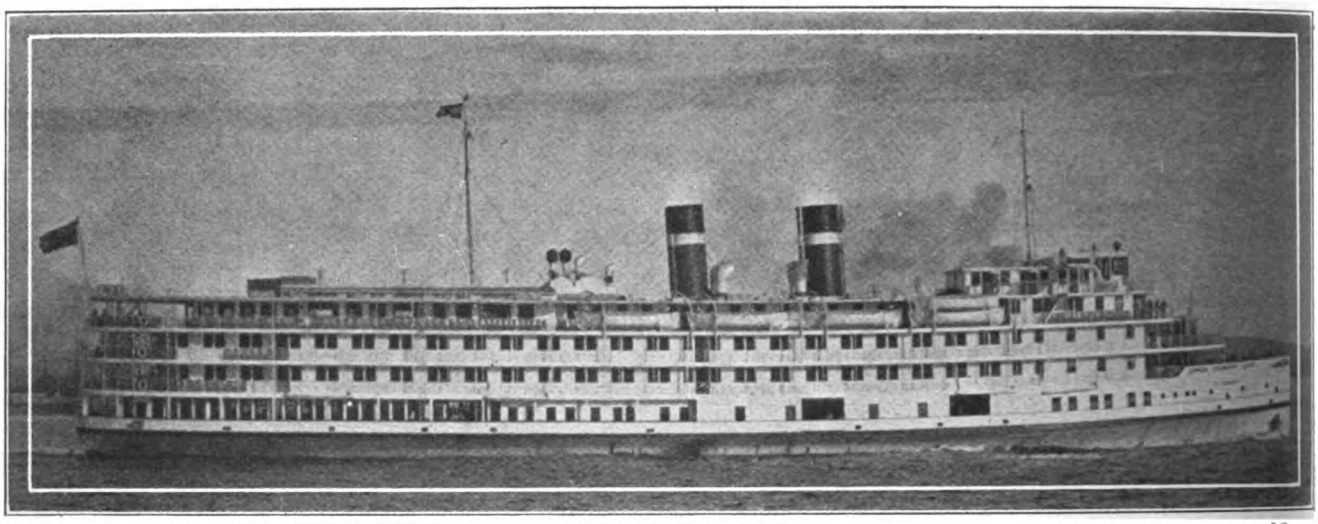

The S. S. St. Lawrence—New Passenger Steamerfor the Montreal-Saguenay Run of the Canada Steamship Lines

Build New Passenger Steamers for St. Lawrence River Service

THE increasing popularity of the Montreal-Saguenay route on the St. Lawrence river, has led the Canada Steamship lines to place a new and specially designed vessel upon this service this summer. The vessel went into commission in June of this year, and was named the ST. LAWRENCE, after the celebrated river.

The ST. LAWRENCE was built at Levis, Quebec, by the Davie Shipbuilding Co., and under the superintendence of Prof. Herbert C. Sadler, consulting naval architect to the Canada Steamship lines. Great credit is due to the builder in getting the vessel completed in time for this season's trade, as, notwithstanding a serious delay due to a fire which occurred while she was on the stocks, she was delivered on time. The machinery was built in England by Richardsons Westgarth & Co. of West Hartlepool, and owing to the coal strike, was also somewhat late.

In general, as the accompanying illustrations show, she is of the familiar type, with passenger accommodations on the three upper decks, A, B, and C, and with space for freight and automobiles on the main or D deck. The dining saloon is also placed on this deck at the after end. The orlop or E deck is arranged for the accommodation of crew forward with galley and cold chambers aft.

The particulars of the dimensions are as follows: Length overall, 338 feet 7 inches; length between perpendiculars, 329 feet 10 inches; beam extreme, 68 feet 3 inches over guards; and depth molded 20 feet 2 inches.

DINING ROOM S. S. ST. LAWRENCE—NUMEROUS LARGE WINDOWS PROVIDE UNOBSTRUCTED VIEW IN ALL DIRECTIONS

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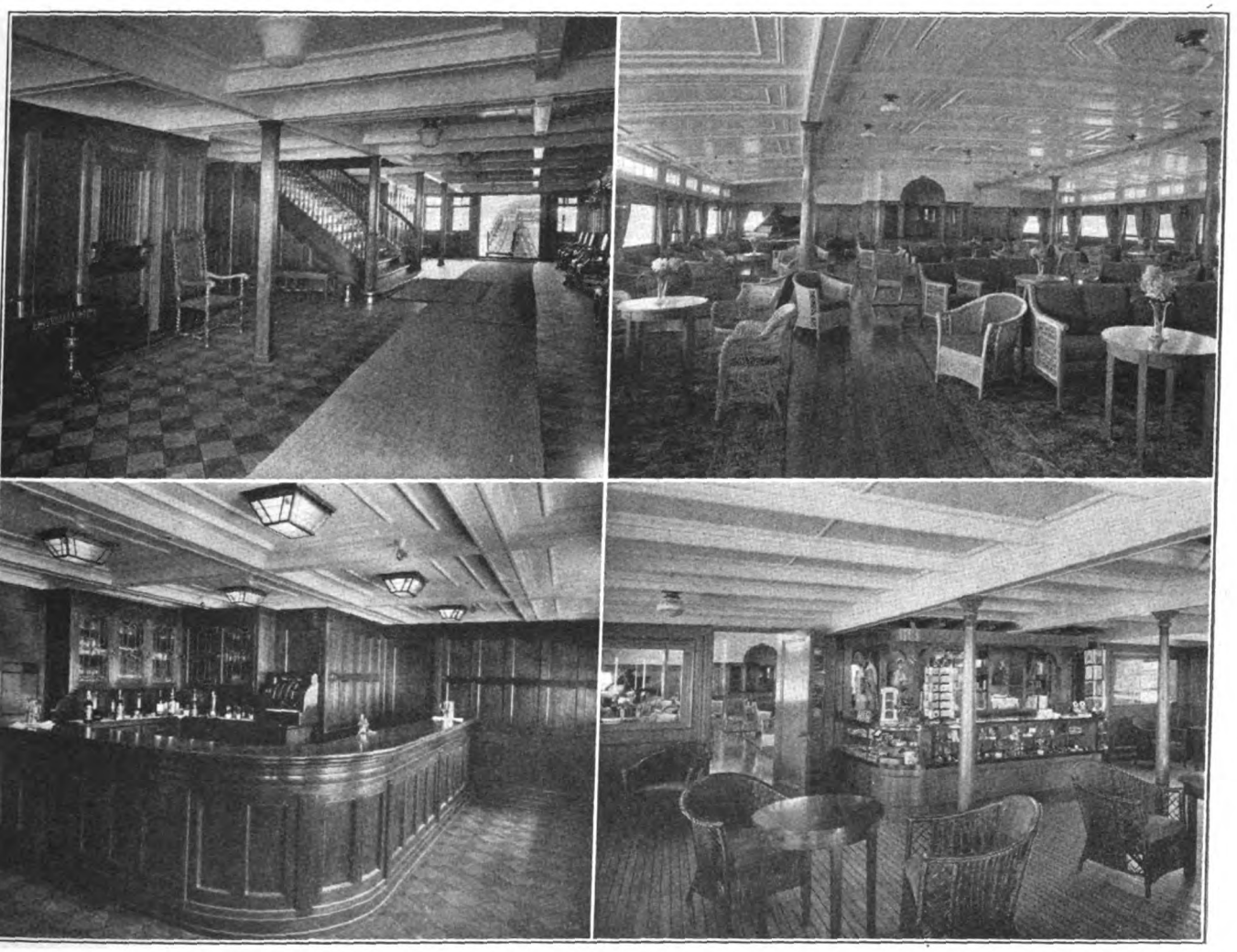
She is built of steel to the C or spar deck, with light steel deck houses throughout all the decks, and to the highest class of the British Corporation registry. A double bottom extends from the fore peak to the after peak bulkhead, and is arranged for carrying a reserve supply of fuel oil under the boilers. She is sub-divided into eight watertight compartments throughout the length, and has also



INTERIORS OF CANADA STEAMSHIP LINES' NEW STEAMER ST. LAWRENCE. UPPER LEFT—MAIN ENTRANCE LOBBY. UPPER RIGHT—OBSERVATION AND DANCE ROOM. LOWER LEFT—BAR ROOM—FINISHED IN LIGHT WALNUT—LOWER RIGHT—VERANDA LOUNGE WITH WHITE PINE SHIP'S DECK

oiltight fuel compartments between the boiler rooms.

The machinery consists of two sets of four cylinder triple expansion engines with cylinders 22 x 37 x 39 x 39 x 36-inch stroke designed for 134 revolutions per minute maximum and a total of about 4700 indicated horsepower. The boilers are of the scotch single-ended type, six in number, of 13 feet 2 inches in diameter by 11 feet long, and fitted for oil fuel with heated forced draft.

The accommodations throughout have been arranged with the idea of securing the maximum comfort for the passengers and with a sufficient variety to suit various tastes. On each of the decks a number of parlors with twin beds and bath room attached have been arranged, giving a total of 20 in all. There are also 96 two-berth rooms with toilets attached, and 136 ordinary two-berth rooms. All the rooms are outside rooms, with staggered upper and lower berths, so that practically each two berth room is equivalent to two single berth rooms, as each person occupies opposite ends of the room. In the original design arrangements have been made so that the number of rooms with toilets attached can be readily increased in the future without disturbing any of the cabin accommodations.

There are also ample general bath room and toilet facilities on each deck.

One of the principal features is the large observation and dance room situated on the A deck. This is arranged with large glass windows so as to give an unobstructed view of the various scenic effects of the St. Lawrence river. It has been finished in a light greenish gray hardwood, with wicker and other furniture specially designed to tone in with the same; the whole scheme giving a light and cheerful effect. Immediately aft of this room is a veranda lounge, finished somewhat in the same style as the observation room, and with a white pine deck to give a "ship's" touch.

The main dining room is finished in a light walnut with warm green furnishings. This room also has large and low windows, similiar to the observation room. The main entrance, bar room, and stairway are also finished in light walnut. Throughout the vessel all elaborate paneling and unnecessary decoration have been reduced to a minimum, so that the whole effect leaves the impression of quietness and good taste. The public rooms were finished by Randall & Co. of Montreal, and the furniture and fittings were designed and furnished by T. Eaton & Co. of Toronto.

Two other vessels similar to the ST. LAWRENCE but slightly larger are

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PARLOR ROOMS WITH TWIN BEDS AND BATH ATTACHED. THERE ARE TWENTY SUCH ROOMS

now under construction at the Davie Shipbuilding Co., Quebec, and will go into service next year.

With the addition of the three new vessels to the existing ones, the Canada Steamship lines will have a modern fleet of ships on the lower St. Lawrence which will be second to none for this type of service.

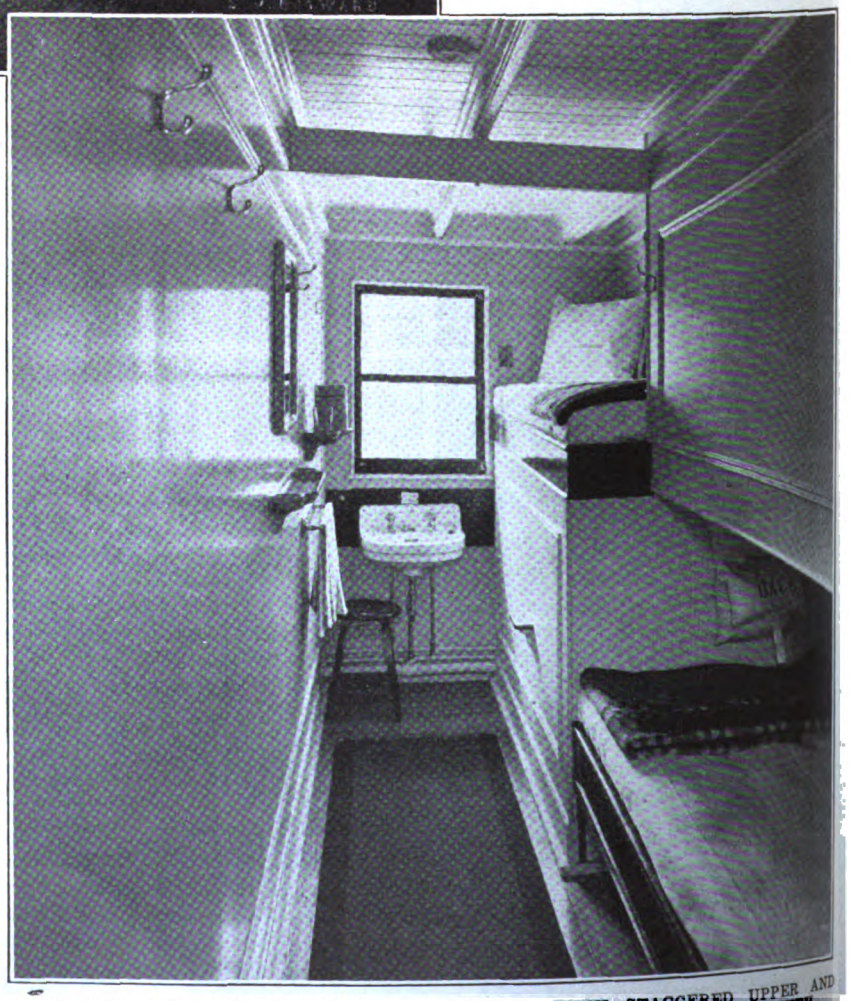
Launch S. S. California

The largest American passenger vessel, the S. S. CALIFORNIA, was successfully launched at Newport News Shipbuilding & Drydock Co. on Oct. 1.

A large party, invited guests of the International Mercantile Marine Co., owner of the ship, and of the shipyard, attended the launching. The day was clear and very warm. The party from New York was headed by P. A. S. Franklin, president of the I. M. M. company He was accompanied by Mrs Franklin and their daughter, Mrs. Roland Palmedo, who christened the famous vessel. Others in the party from New York were: John H. Thomas, and A. C. Fetterolf, vice presidents; J. F. McCarthy, manager of the Panama Pacific line; Capt. Rogert Williams, manager for operations who has direct supervision of the ship's construction, and others.

After the launching a lunch was tendered the guests at the Tide Water club by the shipyard. Mr. Franklin and the sponsor, Mrs. Roland Palmedo, were introduced by Homer L. Ferguson, president of the Newport News Shipbuilding & Dry Dock Co., and addressed the diners in brief appropriate speeches. Gen. A. C. Dalton also made an address in which he pointed to Mr. Franklin and himself as friendly rival managers of large shipping groups. He expressed the hope that the time would come when it would be possible to have a high class passenger service across the North Atlantic under private ownership and operation.

One of the remarkable features in the construction of the CALIFORNIA is the degree of completion which has been attained while on the stocks. She is said to be nearly 85 per cent completed and delivery is planned for December. She is scheduled to make her first sailing from New York for California ports via the Panama canal on Jan. 28.



ORDINARY TWO BERTH ROOMS—ALL OUTSIDE WITH STAGGERED UPPER AND LOWER BERTHS. THERE ARE 136 OF THESE AND ALSO 96 OTHERS WITH TOLET ATTACHED—S. S. ST. LAWRENCE, CANADA STEAMSHIP LINES

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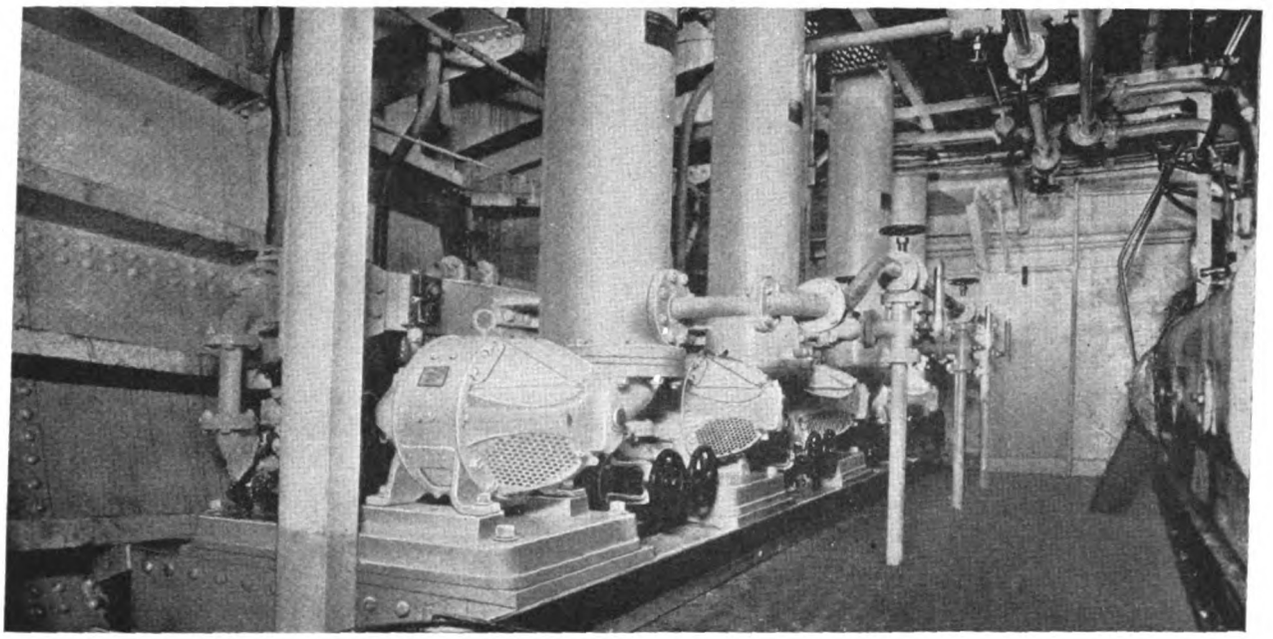

Electric Driven Oil Cooling Pumps on the J. W. Van Dyke

Electrify Shipboard Auxiliaries for More Economical Operation

By A. O. Loomis

A REVIEW of the past and present standards for auxiliary power on shipboard discloses some interesting comparisons. Recent developments in the use of electric auxiliaries have been so marked that their use is no longer a matter of controversy. This conclusion is particularly true when considering auxiliaries on vessels driven by diesel engines.

The growing popularity of the motorship during recent years has served to speed up the general development and application of electric auxiliaries for use in the merchant marine. By using electrical power the generating plant can be economically operated by virtue of its division into units each intended for use at nearly maximum ratings.

Complete electrification of auxiliaries on diesel ships is logical on account of the absence of steam power and because of the resulting economy in handling the sea and port loads.

The manufacturers of electrical equipment have co-operated fully with shipbuilders and operators so that at present electricity can be applied on shipboard to the complete satisfaction of the ultimate customer, the ship operator. The veiws of electrical engineers have not been restricted by precedent but rather have been formed as a result of their ability to apply suitable equipment for the purpose intended exactly as they have done in land practice. The reliability and efficiency of electrical equipment are recognized in marine circles. Marine engineers do not hesitate to be shipmates with their volt-ampere friends.

Auxiliary Generating Sets

The modern ship's "lighting" set is far in advance of what the term implies. The need for illumination from incandescent lamps is no where greater than on shipboard, and like many other marine experiments, was first tried about forty years ago in our navy. At that time the steam engine driven sets were small, usually belt-connected; the voltage did not exceed 80, and output was reckoned in number of lamps in circuit. As time went on, especially within the last decade, the ratings of the machines and the voltage values have been increasing. Both of these now indicate the use in general of a power connected load, since the aggregate ratings of generating units on merchant cargo vessels, especially those having diesel drives, are in excess of 200 kilowatts, and the line voltage is 240. Three-wire generators or balancer sets are used to supply the neutral connection for the 115 volt lighting circuits. Some present installations have 220 volt lighting, thus simplifying the plants.

The construction and particular treatment of electrical equipment to make it suitable for marine use, particularly for the high seas should be emphasized.

There is, first of all, the problem of moisture. The impregnation of field coils and special treatment of the armature coils overcome the tendencies toward short circuits, grounds and burn-outs. Brush holders made from brass, either cast or built up from sheets, have been found most satisfactory to resist corrosion. Small bolts, nuts, screws, etc., are sherardized. Bearing housings receive special attention to prevent the spilling

The author, A. O. Loomis, is a member of the staff of the Marine Engineering Department of the Westinghouse Electric & Mfg. Co. This article was written for Marine Review at the request of the editor.

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of the oil when the vessel pitches. Generating sets should be mounted with their shafts in a fore and aft position, not only to facilitate provision against oil leakage as a result of tilting the generator, but also to reduce bearing pressures as a result of the gyroscopic action of the rotating parts.

The stopping of oil leaks from the bearings of electrical machinery has seemed to Westinghouse of such importance that a sealed sleeve bearing has been developed which will operate for a long priod without attention, leakage or replacing the oil.

Designed to Suit Service

Special considerations in the design of the mechanical parts are dependent both upon the location and form of drive of the sets. Often the sets are located where dripping moisture is a source of danger to the commutators and exposed windings. The addition of canopy covers to the top halves of the frames, is effective in diverting dirt and moisture which otherwise may cause damage.

Regarding the question of suitable voltage supply for use on shipboard, the American Institute of Electrical Engineers through the Marine committee, has recommended 240 volts for auxiliary sets except for small capacities where the ratio of power load to lighting load is usually small, in which case 115 volts is recommended.

The determination of capacities and number of generating sets, is a consideration dependent upon the normal and maximum loads at sea and in port. Usually the loads at sea are fairly steady, these being made up of lighting, engine room auxiliaries, steering gear, heating appliances, and the like. The port load for cargo-carrying vessels, excepting those having liquid cargoes, is generally fluctuating, being composed of the winch load, lighting and small power loads.

The determination of the size of the plant is often based on the port demand, this being greater usually than that at sea, both because of the comparative size of the winch load, and on account of its fluctuations.

For obvious reasons, a spare set which can be substituted for any other connected to the auxiliary power bus, should be installed as a part of the regular plant equipment.

Need Two Generating Sets

In order that the power supply be reliable, especially for sea-going vessels and those operating on the Great Lakes, not less than two generating sets should be installed on any one ship. Exceptions to this rule are found on small boats operating on bays, sounds, and lakes other than the Great Lakes, where a single set is augmented by storage battery operation, and a comparatively small emergency generator. For river vessels, one generating set of peak load capacity is specified by the Marine rules as adequate for the service.

The extensive use of electricity on diesel ships, especially the larger ones carrying passengers on the ocean, has actually made necessary for some of them the largest auxiliary power plants afloat. The auxiliary plant on the passenger and freight liner MONTE SARMIENTO (gross tonnage 13,628) built in 1924 for the Hamburg South American Steam Navigation Co., has five 450-kilowatt, 220 volt, direct current generators, direct connected to diesel engines. This surpasses the size of the auxiliary power plant on the LEVIATHAN, or even that of a modern battleship, and indicates the growing popularity of electricity on shipboard.

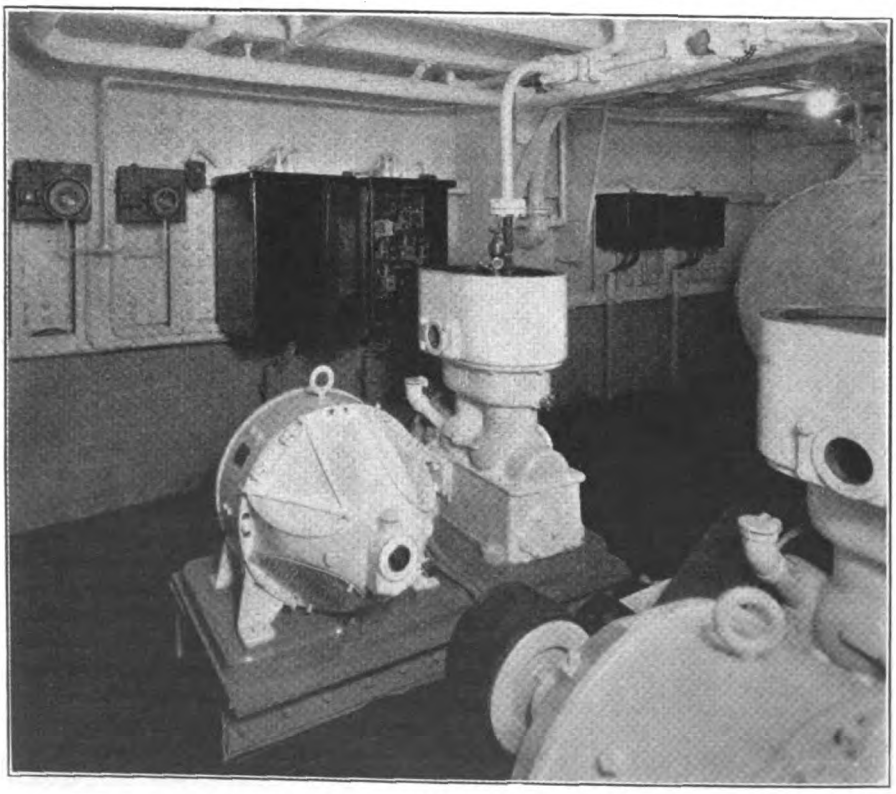
Motors and Controllers

Usually because of the fact that the location of most of the auxiliary motors is likely to be less favorable than that of the generators, the former are more completely enclosed than the latter. Drip-proof and enclosed, self-ventilated motors are applied most generally in the engine room. However, where the location of the motor is such as to give it good protection from mechanical injury and the dripping of water or oil, open motors are permissible.

Contactor type starters enclosed in drip-proof cabinets and having the push button type of masters are very popular. Centralized control stations, having the switchboard type of controllers, have been applied with much success to engine room equipment and blower installations located elsewhere throughout the vessel.

Although the centrifugal pump is well suited to direct connection to the motor shaft, and therefore, its wide use on shipboard is highly desirable, installations where suction is necessary are more satisfactorily made by means of positive displacement pumps. Moreover, the piping layout may include air pockets, or the supply tanks, like the bilges, may be below the level of the pump suction. Under such conditions, when the vessel is under way and the liquids, having low levels, are agitated and air introduced, satisfactory service from centrifugal pumps cannot be obtained. Hence, recourse is made to positive displacement pumps for bilge and ballast service, and often for the fresh water supply.

Motors for driving plunger pumps should preferably be totally enclosed, or at least enclosed on the driving end. The drip-proof motor can be excellently applied to the rotary and centrifugal pump. The coupling form of drive permits the use of normal shaft and bearing sizes, also mini-



ELECTRIC DRIVEN AIR COMPRESSOR ON THE TANKER J. W. VAN DYKE

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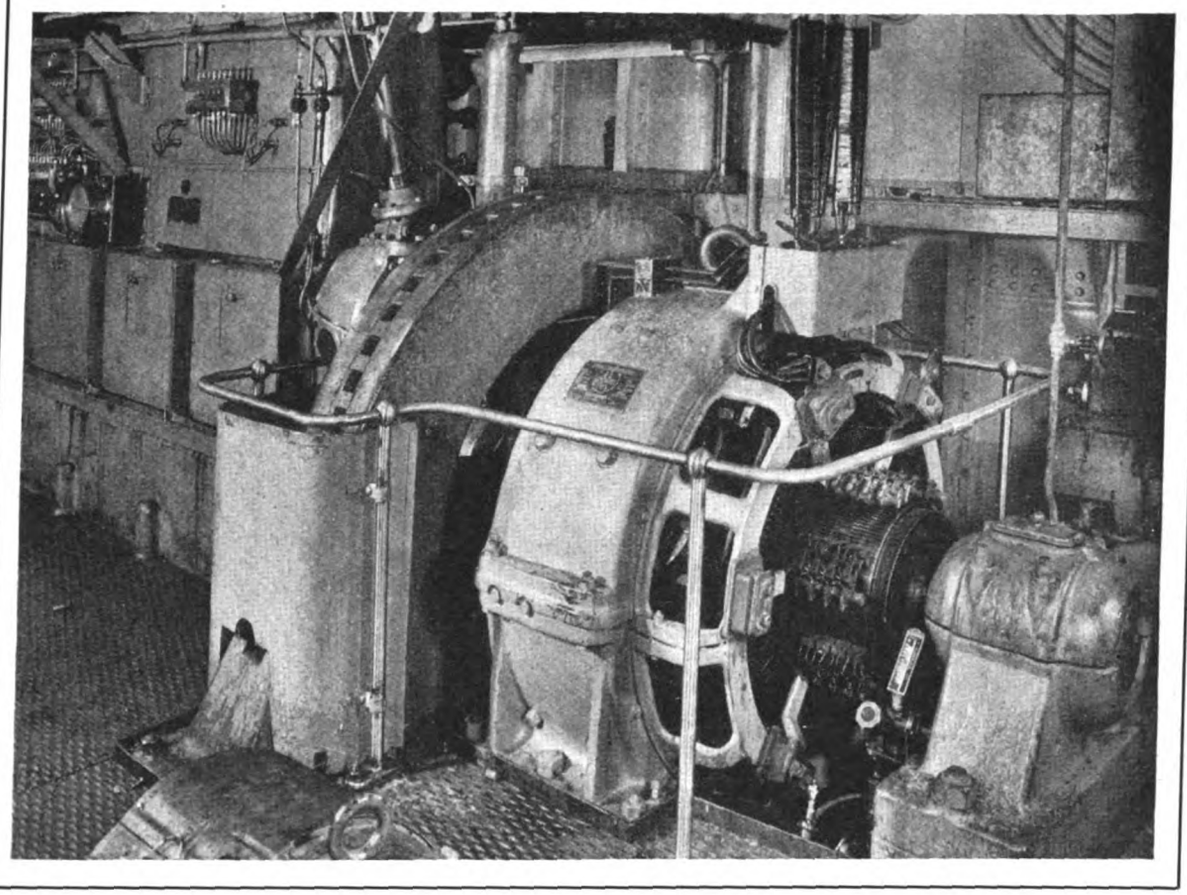

150 Kilowatt Diesel Generating Set on the United States War Department Hopper Dredges

mum overall space and weight.

The question of the cooling water circulation on the motorship is of importance. The engine cylinders are cooled to best advantage by the use of fresh water, which has the least corrosive effect upon the inaccessible passages within the castings. A second circulating system within the cooling coils for the fresh water, and having sea water as the cooling medium, can be best served by a centrifugal pump with its suction below the ship's water line. For this particular service, as well as that for the cooling of oil, the quantity of the circulating sea water, being dependent upon its temperature, which varies over wide limits, should be regulated by speed adjustment of the centrifugal pump, rather than by throttling. For this purpose, approximately 10 per cent speed adjustment of the pump motor is recommended.

Moderate sized equipment, usually below 30 horsepower is used for turning the main engines slowly. For this service, the manual type of controller (usually cam or drum type) with separately mounted protective panel and resistors, is offered. Since the turning over operation may be continuous during the entire cycle or revolution of the main unit, resistors good for continuous service are needed in the armature circuit, so that the controller handle can be left on any point and the speed adjustment obtained over extended periods. By means of a separately mounted panel, overload and low voltage protection is obtained so that the motor will stop if sufficiently overloaded, or upon substantial reduction or loss of the line voltage.

Looking for examples of magnetic controllers in the engine room, one finds several varieties which are classed as semi-magnetic, and full-magnetic. The former are more generally used than the latter. For the automatic operation of pumps and compressors, pressure gages with relays, diaphragm and float switches are substituted for the ordinary form of push button operation.

The plain starter arranged for bulkhead mounting with a push button placed on or near the motor to be started, is most frequently seen on shipboard. Except for the switchboard type of controllers, cabinets should be supplied to protect the parts on the panels from accidental injury, or from dripping water or oil. The push button station makes it possible for the attendant to start or stop the motor. Such equipment can be used for the fresh water and flushing pumps, compressors and refrigerating machines for non-automatic operation, machine-shop group drive, engine room blowers, etc.

(*To be Continued*)

Norman F. Titus, chief of the transportation division, foreign and domestic commerce, department of commerce, addressed the Propeller club at luncheon Oct. 26, on the topic of shipping methods abroad. Mr. Titus recently returned from an extensive trip abroad where he studied transportation and cargo handling facilities in different leading ports.

Commodore Herbert Hartley, commander of the S. S. LEVIATHAN, flagship of the United States lines, was made a chevalier of the Legion of Honor by the French government when the vessel called at the port of Cherbourg in mid September.

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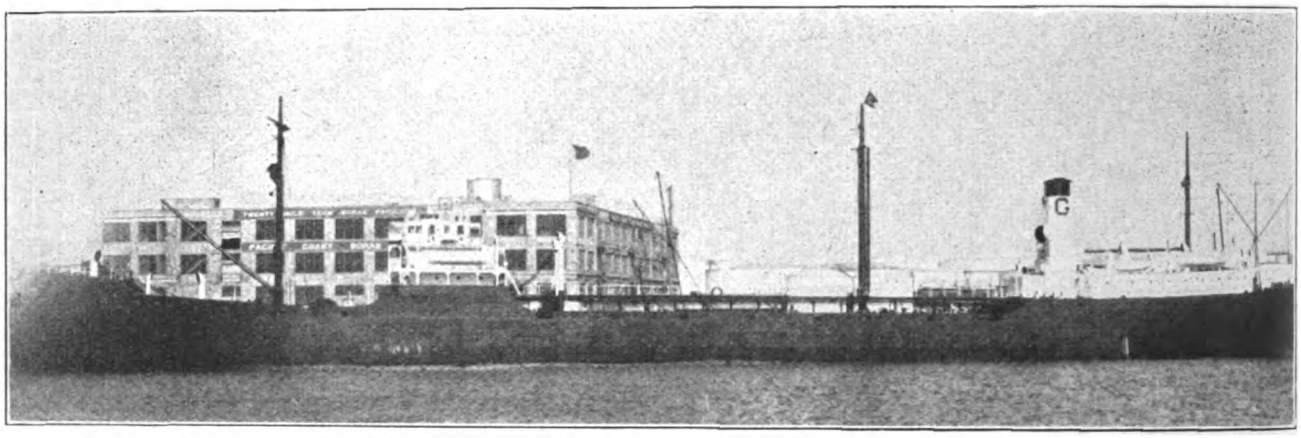
Purify Oil for Diesel Engines

Removes Materials in Fuel and Lubricating Oil That Are Harmful to Engine—Also Improves Economy and Reduces Oil Consumption

BY LEE H. CLARK



Tanker Lio of the General Petroleum Corp.—Equipped with Presurtite Centrifuges for Diesel and Lubricating Oil—Bethlehem Diesel

THE centrifugal oil purifier has created for itself a role of gradually increasing importance to the diesel engine operator. Historically, it was first used for the single purpose of conserving oil—extracting the useful lubricant from batches of waste oil periodically drained from the crank cases of diesel engines. The cleaned recovered oil was returned to the engine for use in place of new oil.

The use of the purifier has since been extended to the cleaning of fuel oil before burning and to the continuous by-pass purification of lubricating oil, in contrast to the older batch method. At the present time oil saving is generally a secondary reason for using the purifier. Its primary and, in the long run, its most profitable function is to reduce to a minimum the materials in fuel and lubricating oil that are harmful to the proper and economical operation of the diesel engine.

Removes Impurities from Oil

These impurities may be present in the oil in its original condition, as in fuel oil, in which case the purifier extracts them before the oil is burned. They may be formed concurrently with or as a result of engine operation, as in lubricating oil, when it is the function of the purifier to remove them as quickly as possible after they are formed. The net result in either case is the adequate protection of closely fitting, accurately adjusted machined surfaces from the wear sure to rusult from the presence of abrasive and nonlubricating materials in the oil, and the assurance of a clean supply of oil that will not deposit sediment and sludge to impede its passage through pumps, piping, atomizers, fuel nozzles and drilled oil passages.

Engine Builders Recognize Value

Naturally these advantages are accompanied by actual economy in both fuel and lubricating oil. Clean fuel burns more completely without the considerable losses due to excessive carbonization and misfiring often resulting from the use of dirty fuel. Water in fuel will lower the available B. t. u. by the amount of heat necessary to vaporize the water. The oil in a lubricating system that is properly cleaned by centrifugal force need never be removed and discarded. The only expenditure is for oil that is actually consumed in the engine, accidentally wasted, or the small amount removed by the purifier mixed with the extracted impurities.

The author knows no better evidence of the value and worthwhileness of centrifugal oil purification than the fact that at least ten prominent builders of oil engines have installed one or more centrifuges on their test floors or for engines operating in their own plants. One of these builders protected an engine with three Sharples super-centrifuges—one for lubricating oil and two for fuel oil—when an engine was being run on a thirty day acceptance test. When every possible precaution is necessary to insure trouble-free continuous operation and to meet rigid guarantees of economical performance, centrifugal purifiers are an essential part of the auxiliary equipment.

Many builders strongly urge that every engine they install be equipped with adequate centrifugal equipment. There is a feeling that it is only a question of time when these auxiliaries will be sold as standard equipment with each new engine. Such feeling is amply justified by countless instances of economy of oil and maintenance and freedom from operating difficulties that have resulted from properly installed and operated centrifugal purifiers.

The centrifugal builders have kept pace with the steadily increasing demand for their products, developing new designs to meet the changing needs of the marine operator. The widespread use of heavy fuel oil and the need for its purification at high temperatures has been met with enclosed type machines, one make of which is shown in the accompanying photographs of installations of Sharples presurtite supercentrifuges.

Use Lower Gravity Oil

The use of low grade, low Be. gravity fuels has meant fuel economy to the ship-owner and made him independent of the fluctuating and uncertain market for high-grade so-called diesel fuels. However, the impurities in such oils have been the cause of considerable operating trouble and excessive repair and maintenance charges. Centrifugal purification has afforded a satisfac-

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The author, Lee H. Clark, is connected with the Sharples Specialty Co. This article was prepared at the request of the Editor.

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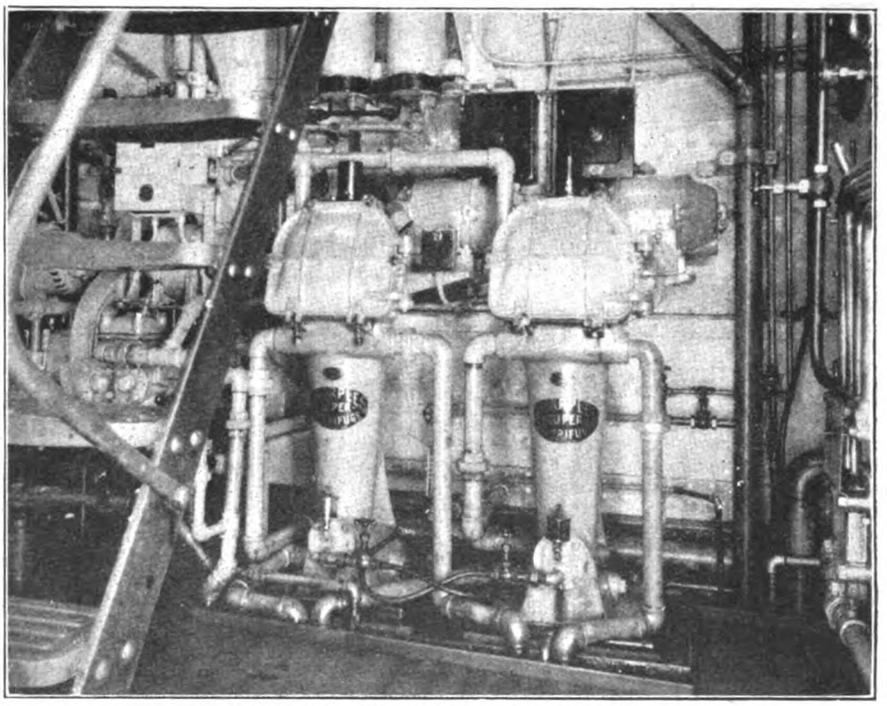
tory relief from such annoyances and, except in the few cases where engines are unadaptable in design to their proper combustion, the operating results obtained with centrifugally purified boiler and bunker fuels compare favorably with those secured from the best grade diesel fuels.

Centrifugal purification has proven to be the only really satisfactory method. The high viscosity of these fuels prevents sedimentation of impurities by gravity under any reasonable conditions of time and temperature. Their removal with the super-centrifuge is positive down to the point where they no longer exist in such quantities or size as to be a source of danger to engine operation.

A phase of diesel engine design that has received a great deal of attention recently is the proper atomization of fuel so as to secure a uniform mixture of the oil with air and an even distribution of this charge throughout the combustion chamber. Much time and thought have been devoted to the design and manufacture of fuel pumps, valves, nozzles and atomizers and the location of ports and valves in cylinder walls. It is recognized that much of the smooth operation and fuel efficiency of the diesel depends on these factors and on the proper operation of such parts.



SHARPLES PRESURTITE CENTRIFUGES ON THE MOTOR TANKER LIO

It is difficult to believe however that the maximum results from research and careful design can be secured when the ordinary run of commercial fuel is used without previous purifiication. The extraneous solids in such oil are certain to deposit in and clog small passages and orifices and to cause excessive wear. The centrifugal purification of fuel would seem to be much the simplest method of avoiding all

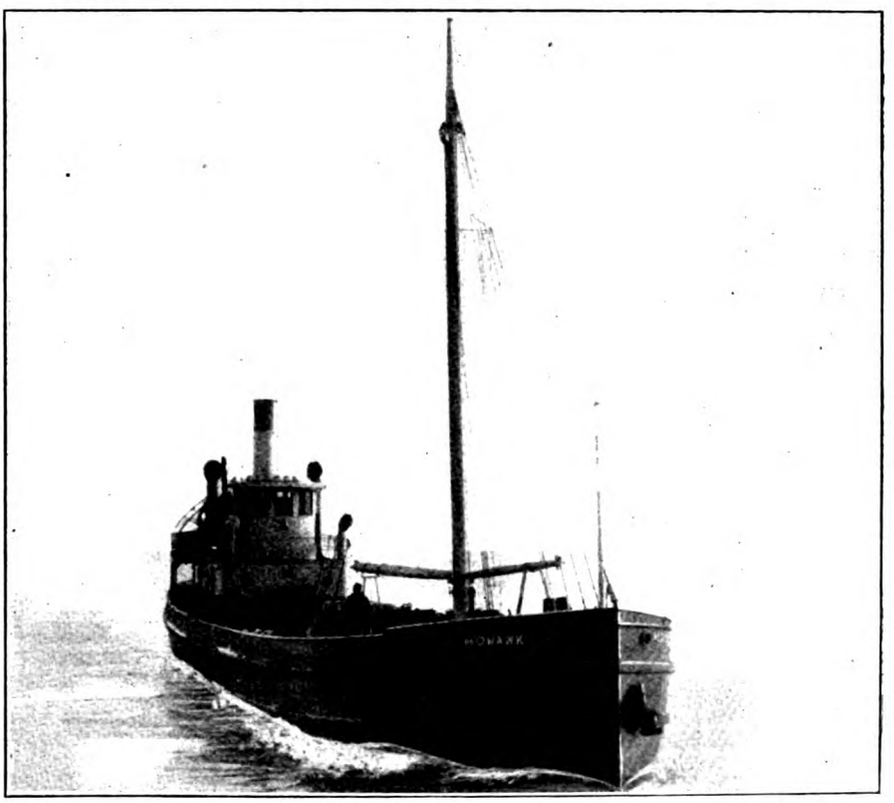
(*Continued on Page* 80)

Speed and Earning Power Increased

THE tanker MOHAWK, owned by the Gulf Refining Co., N. Y. was recently changed from gasoline engine drive to heavy duty full diesel. This vessel is 153 feet long, 23 feet beam, 11 feet draft and of 339 tons. Her new propulsive power consists of one 6-cylinder 12-inch bore by 17-inch stroke, 330 horsepower, direct reversing Standard Motor Construction Co. diesel engine.

From reports received the speed of the vessel has been increased and the cost of operation has been considerably reduced. There is also greater reliability, so that the earning capacity of the vessel has been definitely increased.

The engine is of the four cycle type and is equipped with the latest valve shift for starting and handling which in its simplicity is similar to that of an electric switch. A small lever operates the pilot valve which allows the lubricating oil pressure to shift the valve shaft with utmost definiteness to the different handling points without any physical effort on the part of the engineer.



GULF REFINING CO. TANKER MOHAWK, EQUIPPED WITH 330 H. P. DIESEL

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Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

By Harry Bowne Skillman

Attorney at Law

A SHIPOWNER'S unreasonable delay in answering the charterer's request for removal of the ship to facilitate loading may prevent collection of demurrage, under the rule requiring promises to take all reasonable measures to minimize loss.—New York & Cuba Mail Steamship Co. v. Lamborn, 13 F (2d) 535.

* * *

NOTICE of claim for damage to cargo of sugar from coal dust, given more than a week after discharge of the cargo on the pier designated by the consignee, was too late, under a bill of lading requiring claims to be made "on taking delivery."—TEXAS MARU, 13 F. (2d) 538.

* * *

IF A SEAMAN is discharged without justifiable cause before the termination of the voyage he is entitled to full indemnity, which may be measured by the stipulated wages for the entire voyage and the amount of expenses in returning to the port of discharge, deducting what he earned, or reasonably could have earned, in other employment during the period of his engagement."—United States Steel Products Co. v. Adams, 13 F. (2d) 614.

* * *

WHERE sinking of a tug was due to negligence of the owner of a pier, who refused to aid in necessary raising, the owner may recover the actual amount expended therefor in the exercise of reasonable diligence and good faith; where a wrecking company required the owner to furnish men familiar with the boat during the raising operation, wages of the men furnished are a proper part of the damages sustained from sinking of the tug.—Virginian Ry. Co. v. United States, 13 F (2d) 772.

* * *

THE American rule as to freights is derived from the English one —that the freight follows the ship, said the court in the case of United States v. Robins Dry Dock & Repair Co., 13 F. (2d) 809, and it was held that there can be no maritime lien on freights, if there is none on the ship.

* * *

TUG licensed for the coasting trade, the license providing that she should not be used for any trade or business whereby the revenue of the United States may be defrauded, in towing a lighter, loaded with a large number of cases of alcohol, from an unknown vessel on the high seas into a harbor of the United States, was employed in a trade other than that for which she was licensed, according to the case of ESTHER M. RENDLE, 13 F. (2d) 839, and was subject to forfeiture.

* * *

EXCEPTION in bill of lading of liability for "decay" applies, not only to inherent decay, but to decay due to any cause, as sea water, unless it be shown that the water entered through negligence of the ship.—Pen-American Hide Co., Inc. v. Nippon Yusen (Kabushiki) Kaisha, 13 F. (2d) 871.

* * *

DELAY in the course of a voyage which does not amount to a deviation is not the proximate cause of an injury from a sudden and unexpected storm.—MARINER, 13 F. (2d) 891.

* * *

CREW of a towing tug were not entitled to an award for salvage services where the tug owner contracted to tow a steamship from a bar on which she was stranded, the contract expressly providing that it was for towage, and not salvage, and the work being done in 18 minutes without danger to tug or crew, and they doing nothing beyond their regular work.—Bond v. A. H. Bull Steamship Co., 13 F. (2d) 893.

* * *

THE United States government, when it enters into ordinary business outside of strict government matters, is responsible for delay and laches of its agents, it was declared in the case of NEW WINDSOR, 13 F. (2d) 925; accordingly, a libel by the United States against the owner of tugs for damages to a vessel, grounded when being moved from a dock to the main channel more than three years before the libel was filed, was held to be barred by laches.

* * *

TOW, if inert and helpless, is not responsible for faults of tug.—No. 34, 13 F. (2d) 927.

* * *

NAVIGATORS are not required to take notice of the location of submarine cables in a bay, so as to create liability of a ship for injury to an unknown cable. Although the United States is not bound by statute requiring notice of the location of submarine cables in a bay, it must give some notice or warning of location before liability can attach to a ship injuring the cables.—GEORGIE, 14 F. (2d) 98.

* * *

A LOOKOUT stationed 100 feet back of the bow, while the vessel was passing in a dense fog through a narrow channel leading to a busy harbor, did not satisfy legal requirements, it was held in the case of WALTER A. LUCKENBACH, 14 F. (2d) 100; the court also held that in order to limit recovery to injuries received in collision, it must be shown that the course pursued by a ship after collision was so plainly wrong that a competent navigator would not have done likewise.

* * *

AWARD of $3000 for salvage service, given by a $50,000 steam tug to barges and launch of the salved value of $16,500, in connection with fire on the barges, was held excessive in the case of INDEPENDENT, 14 F. (2d) 115, and reduced to $1000.

* * *

AN AMERICAN vessel, arriving from foreign ports and having in its crew East Indians excluded from entry into the United States, whose master, after notice from an immigration officer to detain such aliens on board, paid them off and discharged them, was subject to the penalties imposed by the Immigration act, though such aliens were signed on at the same port where discharged and had completed the voyage for which they signed.—LIMON, 14 F. (2d) 153.

* * *

WHERE the one-year period for which seamen signed articles expired before their vessel returned to a port in the United States, but delay was not shown to be due to any unseaworthiness, or fault of the master or owner, the seamen were bound to continue their service until the vessel reached the appropriate final port of discharge, and, having refused to sign new articles for three months or to agree to an extension of the existing articles until the arrival of the vessel in the United States, they were not entitled to maintenance, return transportation or wages after leaving the vessel.—Uriarte v. United States, 14 F. (2d) 164.

* * *

SEAMEN" once meant a person "who can hand, reef, and steer" —a mariner in the full sense of the word. As conditions changed, and necessities of changes increased, "seamen" received an enlarged meaning, and the cook, the surgeon, and employees other than able seamen, were included; a bartender, a muleteer serving as watchman, a wireless operator were classed as seamen; lately, in the case of SEA LARK, 14 F. (2d) 201, an orchestra owner was declared to be entitled to a lien for services on an excursion boat, operated in and about the waters of Puget sound and Lake Washington.

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Cook by Electricity on Malolo

Electric Galley Equipment on the S. S. Malolo for Feeding 1200 Persons — Most Modern of Its Kind — Saving in Space

BY P. H. VIVIAN

WITH few exceptions, until recent years, little attention has been given to the ship's galley. The exceptions were mostly government ships and first class passenger vessels. But times have changed. Electricity has brought about great progress on board the modern vessels.

Cleanliness and convenience of electrical equipment are not the only advantages. Grease fires are eliminated from the galley and electric equipment for cooking and baking as manufactured today is durable which means low maintenance cost and economy of operation. Deck space is saved due to the less restricted choice of location. Such equipment can be placed anywhere without attention to ventilating problems, especially difficult in ship design.

The first direct application of electricity for cooking and baking was made in London in 1894 but it was not long before the United States government applied the principle in practice by equipping the galley of the S. S. ARIZONA at the Brooklyn navy yard. The successful installation on the S. S. ARIZONA was fully proved when installation after installation followed on board United States battleships, destroyers, submarines, etc. Then came the equipping of such vessels as the S. S. REPUBLIC, S. S. LEVIATHAN, the S. S. CALIFORNIA and the S. S. MALOLO.

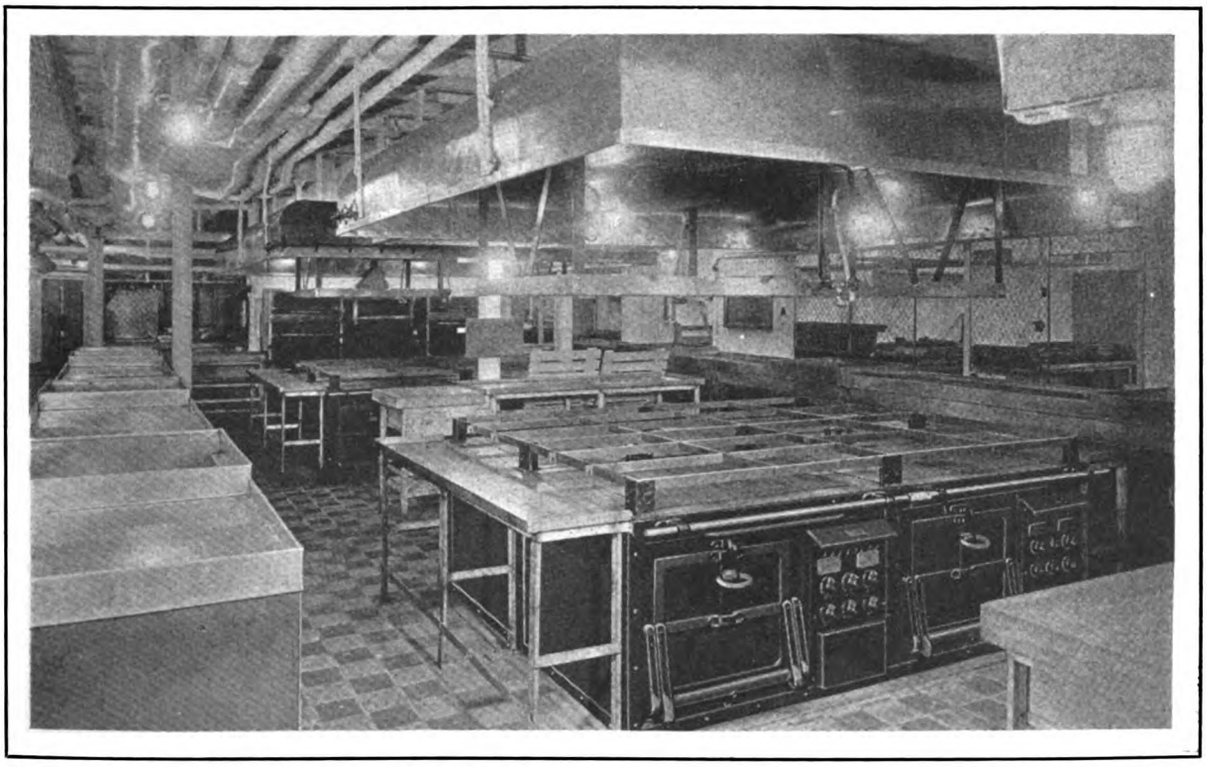
Indestructible Heating Elements

The remarkably durable construction and efficient and economical operation of the electrical galley equipment furnished the MALOLO is due largely to the development of the famous calrod unit, the invention of which revolutionized the electric heating industry. In this unit the heating element is protected from all possible contact with air or corrosive elements because it is suspended in a metal sheet entirely surrounded with finely divided, densely packed, refractory insulation and is capable of withstanding tremendously high temperature. These tubes or units are formed into suitable shapes for various uses. Such heavy service equipment as range tops are formed by casting the units right into the metal itself, thus being further protected against all physical injury as well as oxidization or corrosion. The refractory insulation used in the tubing has the peculiar property of not only insulating and sealing-in the resistor wire but conducts heat as rapidly as metal.

The development of the diesel engine has, also, been responsible for progress in the application of the principle of heating by electricity as well as for other auxiliary uses. Rapid strides have been made in the auxiliary uses of electric power generated by diesel engines and the

(*Continued on Page* 78)

The author, P. H. Vivian, is connected with the Edison Electric Appliance Co., who furnished the Malolo's electrical galley equipment. This article was prepared at the Editor's request.



Main Galley S. S. Malolo—Eight Heavy Duty Ranges—Two Heavy Service Broilers

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Modern Steering Equipment is Especially Suitable for Diesel Drive Ships

By O. B. Whitaker

THE diesel engine has brought along new problems for the marine engineer in the design and selection of auxiliary machinery. Steam makes it possible to operate all kinds of auxiliary machinery with types of engines to suit the particular requirements; but with the absence of steam on the diesel ship other means must be used to drive the auxiliaries as it would be impractical to operate the steering engine, multiplicity of pumps and deck winches with individual oil engines. Electricity steps to the front in popularity as a substitute and promises to outdo steam in extent of usefulness.

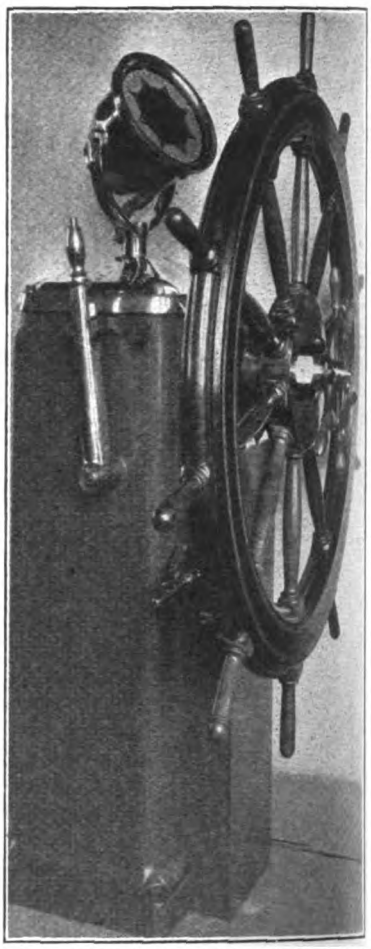
The operation of pumps and other auxiliaries is largely a matter of adapting industrial developments to shipboard use. This has been done so completely and with such little change in the original designs in some cases as to make one believe that he is stepping into an industrial plant when entering the engine room of these vessels. Generators are individually driven by smaller diesels which supply the electrical power for operating the auxiliaries.

Automatic Control of Steering

The gyro-compass has aided materially in this transition by bringing along the development of manual and automatic control of the steering engine by electricity. This development originally started as an automatic steering device operating the steering wheel in the wheel house and depending upon the ship's telemotor, or the steering equipment, to operate the steering engine. This machine has reached a high degree of efficiency and is now in use on a great many vessels. Instances began to arise, however, where it was desirable to operate the steering machinery directly and not through the medium of a telemotor. What is now known as the Sperry two-units gyro-pilot was developed to meet these requirements. In designing this two-unit system, provision has been made for manual as well as automatic steering with facilities for changing from one to the other on the wheel house unit—making it unnecessary to go aft for the purpose of removing or inserting pins in shafting or linkage in the steering engine room. This system, however, operates equally well with either steam or hydro-electric steering machinery.

Electric Follow-up Steering

There is now, however, a growing tendency toward straight electric steering in which case an electric motor of sufficient power to operate the rudder directly through gear and worms is employed. The need of a means giving complete control of this motor from the bridge gave rise to new problems. The simple start, stop and reverse method without follow-up was first used for operating this type of gear but had the disadvantage of unrelated motion between ship movement and the motion applied to the controls for steering purposes. In this type of equipment a controller normally rests in a central or neutral position,—moving it to one side moves the rudder in one direction so long as the controller is held in that direction. When the controller is moved back to the central position the rudder does not return to its amidship position but is stopped wherever it rests. To return the rudder to the amidship position the controller must be held over in the opposite direction for a sufficient length of time to drive it back to amidships. A good helm angle indicator and some practice on the part of the quartermaster is required to steer a ship efficiently with this type of steering.



GYRO PILOT STEERER WITH LARGE HAND WHEEL AND STAND

The gyro-pilot removes this objectionable feature of straight electric steering which promises to be of great popularity on diesel vessels, by providing an electric, follow-up, wheel steering system with complete control over the rudder action. This system does not move the rudder over in steps determined by contact buttons but provides a control having the desired results of the telemotor without the attendant troubles with leaks, packing, etc.

The Diesel Ship from the Bridge

Probably the best examples of this type of steering equipment are installed on the shipping board vessels converted to diesel drive. On each of the vessels the steam steering engine was substituted by a 30 horsepower motor operating through the original machinery. This motor is controlled from the bridge by a Sperry gyro-pilot which provides full follow-up, wheel steering as well as automatic steering. The controller method of steering is also embodied in the same machine for use as an auxiliary. These machines incorpo-

(*Continued on Page 76*)

The author, O. B. Whitaker, is connected with the Sperry Gyroscope Co. and prepared this article at the request of the Editor.

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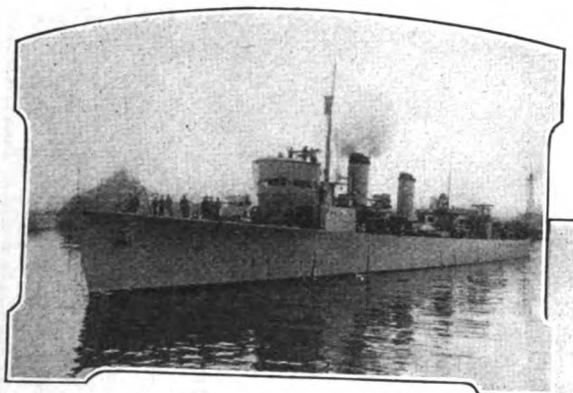
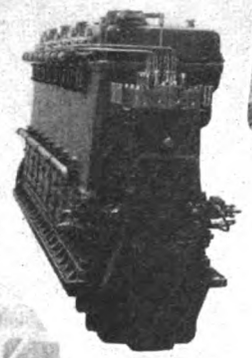
Latest Marine Events in Pictures



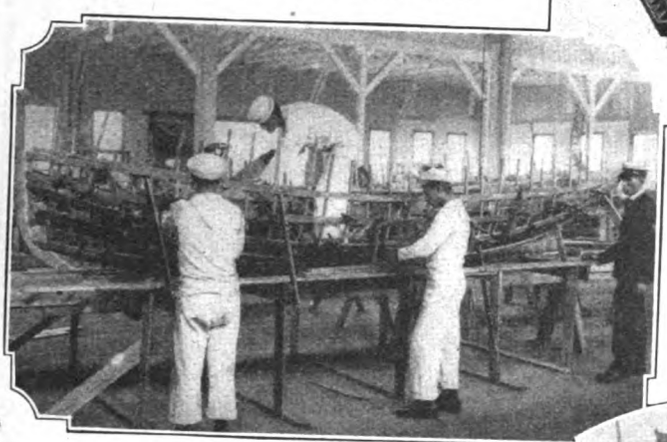
Above—Swedish destroyer Nils Ehrenskjold. Has three 12 centimeter guns, two cannons for airplane defense, depth bomb launchers and torpedo tubes. Speed 37 knots

At Right — Four-Wheel Drive truck in England for hauling life boat to water's edge, then backing into sea until deep enough to float



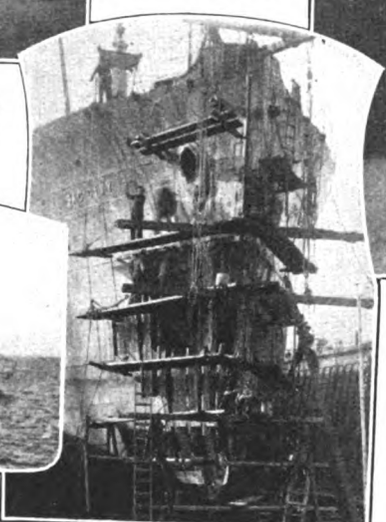
At Left—Type L, 8-cylinder Foos diesel, described on page 53

Dr. Wilhelm Cuno, chairman, board of directors. Hamburg American Line



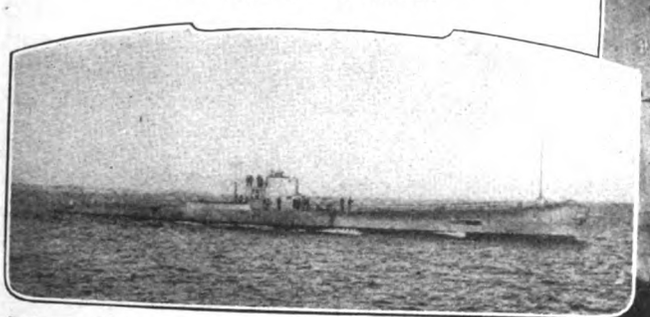
At Left—Learning how to build a boat in the shipright's class. Artificers School, naval training station, Hampton Roads, Va.

Below—S. S. Submarine V-1 leaving Portsmouth, New Hampshire harbor, for Provincetown, Mass. Latest type of submarine

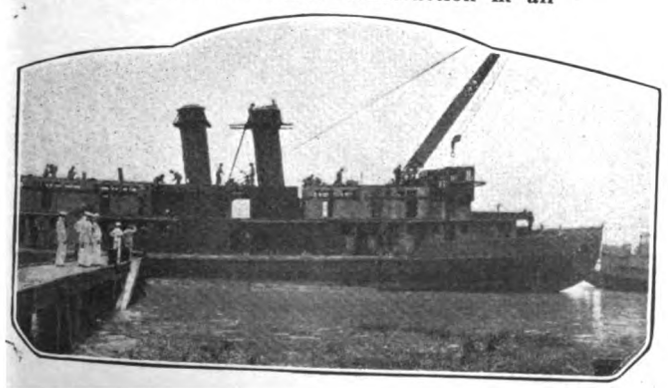


At Left—Sac City, damaged when she collided with and sank the El Sol in New York harbor last March. Repaired at Morse Drydock & Repair Co. in six days time

Below—Sitting room of suite on the S.S. New York, of the Hamburg American Line



Below—China builds gunboats for the United States. Chinese workmen build U. S. S. Guam at Shanghai for United States navy in Chinese Waters. Six boats under construction in all



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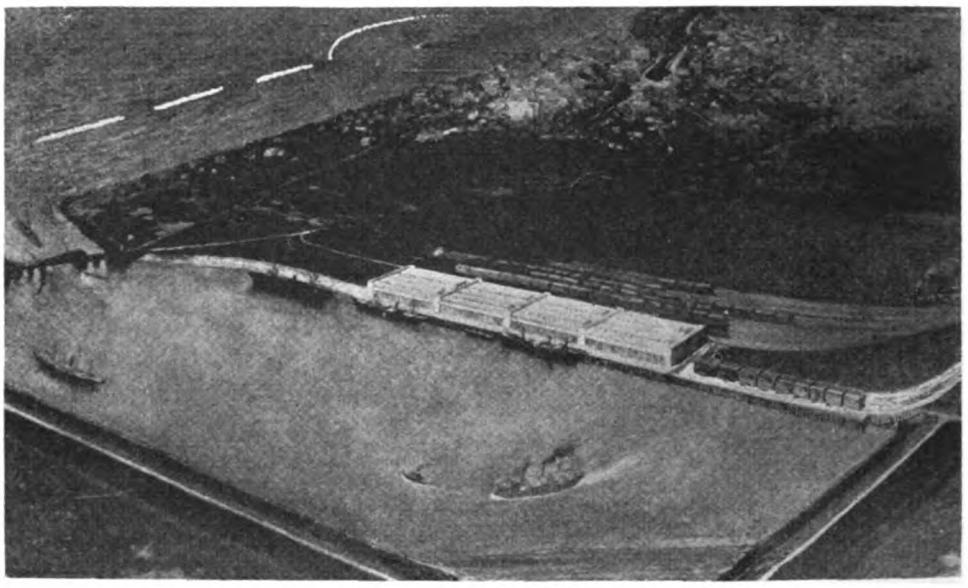
Dock Management Progress Section

How Successful Dock Operators Have Met Problems of Giving Best Service to Ships



Turning Basin, Wharf and Sheds—Port of Corpus Christi, Texas

Corpus Christi---New Ocean Port Serves South Texas Gulf Coast

By Vance Griffith

ON SEPT. 14, 1926, the people of South Texas celebrated the completion of an ocean port at Corpus Christi. The new port serves an area of two-thirds of the State of Texas and particularly the farmers of the southern section. It is now possible to save the rail freight charges to Houston and Galveston for ocean shipping. Because of its facilities it is also expected that the deep seaport of Corpus Christi will compete favorably with other gulf ports in the movement of grain and other exports from Oklahoma, Kansas, Colorado, New Mexico, Nebraska and Iowa. Northern Mexico comprising the states of Chihuahua, Coahuila, Nueve Leon and others will have a convenient outlet for mining and agricultural products.

It was on Sept. 22, 1922, that President Harding signed the bill designating Corpus Christi as the site for a "safe and adequate harbor." Between that date and the formal opening of the port a little over a year ago, $5,000,000 have been spent in development work. A ship channel 21 miles long with an initial depth of 26 feet and a bottom width of 200 feet has been dredged across the Bay of Corpus Christi extending from the city proper to the Gulf of Mexico. Spanning the channel at the entrance to the port is a modern bascule bridge with a 90-foot clearance and a span of 110 feet. This bridge has been especially constructed to carry the tracks of the Southern Pacific railroad and the heavy traffic on the main highway leading northward. It is the largest structure of its kind in the South and can be raised or lowered in 45 seconds. Within this entrance is the port proper or turning basin, 1000 feet wide, 3000 feet long with an area of 2,700,000 square feet all dredged to a depth of 30 feet.

This great basin is completely land locked except for the ship channel entrance. The north and east sides are protected by embankments 15 feet high and 50 feet wide.

Transit sheds line one side of the basin for a distance of 1224 feet. These sheds are 160 feet in width. At the present time there are five units in operation and the construction of others is expected in the near future. They are of fireproof construction and are divided by thick fire walls into units 304 feet long and 160 feet wide. A 20-foot apron wharf fronts the entire development. There is also an additional 400-foot open wharf 50 feet wide. It is at this open wharf that freight is usually unloaded from ship to railroad car and vice versa.

The author, Vance Griffith, is publicity secretary of the Corpus Christi chamber of commerce. He prepared this article at the request of the editor.

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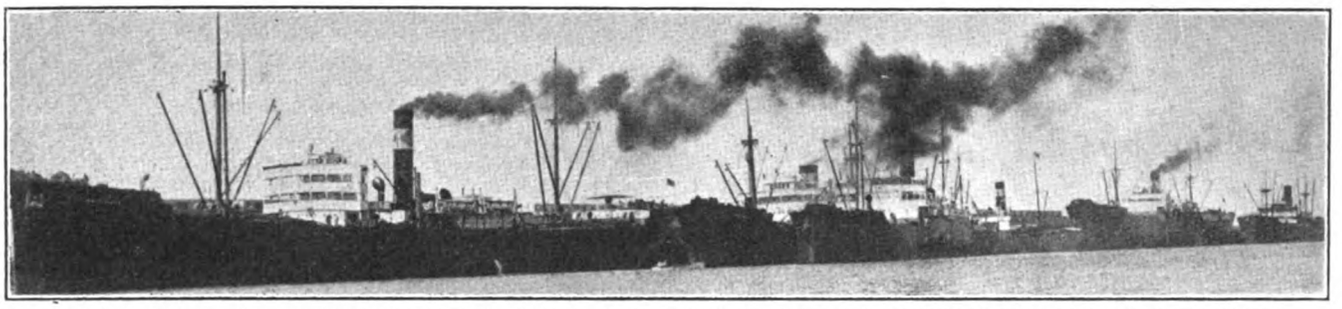


THE COTTON FLEET AT CORPUS CHRISTI, TEXAS—IN ITS FIRST YEAR 100,000 BALES OF COTTON WERE SHIPPED

The area at the back of the transit shed has been filled in to the level of the 15-foot high embankments on which these sheds are built. It is here that the terminals of the Southern Pacific, the Missouri Pacific and the Texas-Mexican railroads are located. It is in this area also that manufacturing plants will eventually be located. A portion of this space is now occupied by the Aransas Compress Co. and a large bonded warehouse. All of this ground belongs to the Nueces County Navigation commission.

Protection against the sweep of the sea is provided by a great breakwater constructed of limestone rocks weighing from 7 to 10 tons each. The breakwater is laid in water from 9 to 11 feet deep, and it is 26 feet wide at the top and 46 feet wide at the bottom. At low tide in the bay of Corpus Christi the breakwater projects 10 feet above water, sufficient to afford complete protection at all times.

The Nueces County Navigation commission controls the port and has shown a broadness of view, which will reflect to the port's interest, in arranging port charges. The pilotage in and out of the port varies from $6 for foreign vessels to $1 for a regular coastwise vessel, per foot of draft. Though not compulsory tug service for outgoing and incoming vessels amounts to $200. The charge to dock a vessel, running lines, etc., is $7.50. Water for both drinking and boiler feed purposes is $.50 per thousand gallons with a minimum charge of $3.00 for each connection.

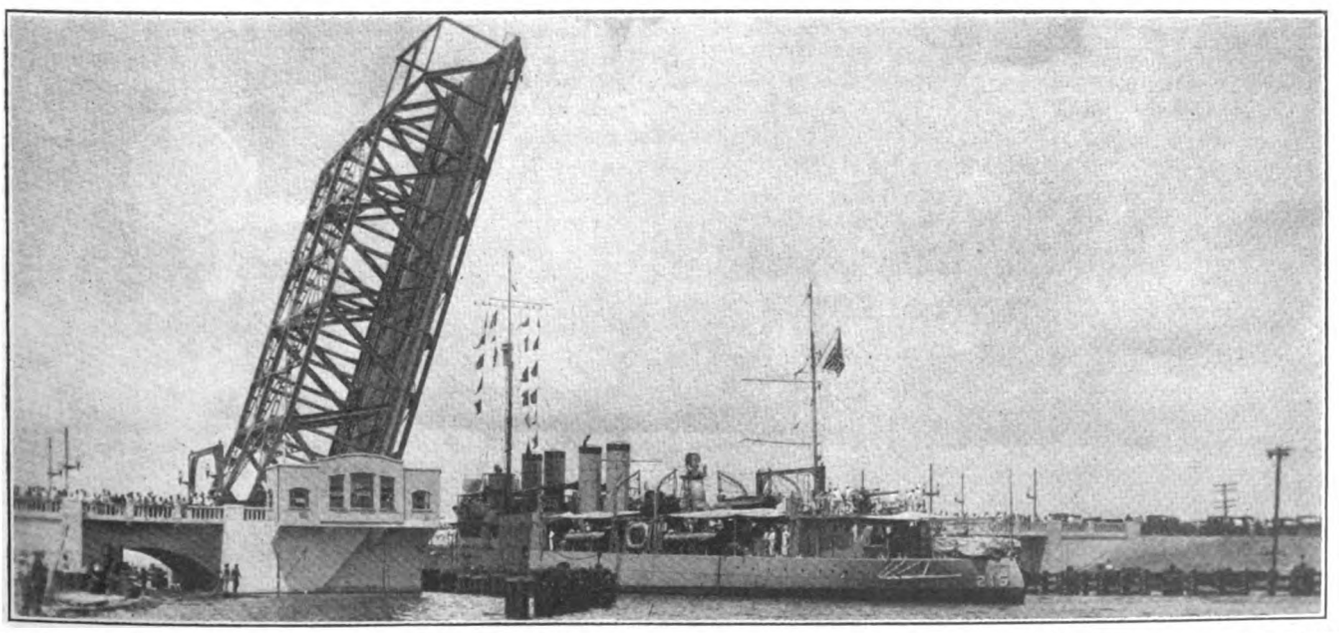
Make Port Charges Reasonable

Vessels berthed at any wharf or made fast to any vessel so berthed while not discharging or loading cargo are charged dockage at the rate of ½ cent per net registered ton per day, Sundays and legal holidays excepted. This also applies to vessels berthed while undergoing repairs. Wharfage charges on coastwise traffic varies for different types of cargo. For the general run of cargo for coastwise vessels, the charges are 12 cents per ton of 2000 pounds. Wharfage charges have been compiled for foreign exports and imports by the port commission and will be given on application for any product.

During the first 12 months that the Port of Corpus Christi has been in active operation more than 260,000 tons of cargo moved down the ship channel and out to the Gulf of Mexico. These figures were compiled under the supervision of J. L. Boyd, director of the port. To be sure, of this rather respectable amount of cargo for a port so young, 200,000 tons consisted of oil from the great tank farms located at Ingleside on the ship channel. The remaining 60,000 tons of cargo was handled at the wharfs and docks alongside the turning basin at the port proper. Cotton produced in the fields of the South Texas Gulf coastal country was by far the most important of the products exported. Approximately 100,000 bales were shipped during this period, consigned to practically every section of the world. There is now compressed and awaiting shipment over 100,000 bales.

Ends First Year As Port

The remaining tonnage handled at Corpus Christi during its first year of operation consisted of 16,000 tons of cotton seed cakes and smaller amounts of cotton seed meal and hull fibers. Though some imports came from Europe, by far the greater amount, made of ammunition, canned



LARGE BASCULE BRIDGE SPANS ENTRANCE TO PORT OF CORP US CHRISTI—A 90-FOOT CLEARANCE AND A 100-FOOT SPAN

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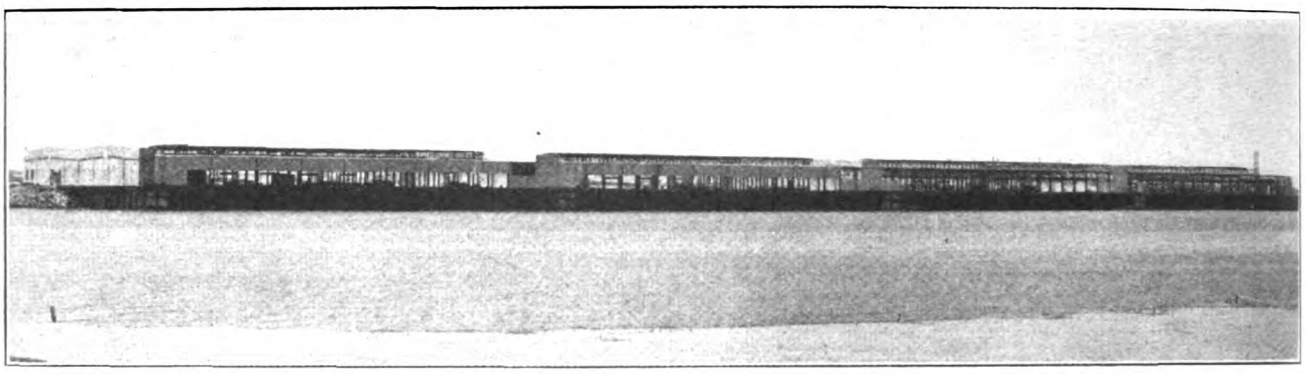


TRANSIT SHEDS FROM THE NORTH SIDE OF THE TURNING BASIN AT NEW PORT OF CORPUS CHRISTI, TEXAS

goods, iron and steel products and miscellaneous commodities, came from the Atlantic seaboard on vessels of the Moore and McCormack lines.

A total number of 125 vessels sailed from the port during this period. Of these, 75 were from Ingleside. Of the remaining 50, 37 were American ships exclusive of 6 Moore and McCormack freighters, 3 Swedish, 2 German, 2 Dutch, 1 Danish, 1 British, 1 Italian, 1 Norwegian and 1 Spanish. Their respective destinations pretty well covered every section of the globe.

It is a rich territory which this new port serves, reaching east and north of Corpus Christi to Cuero and beyond Victoria, north of San Antonio, west for 100 miles beyond Del Rio and south to include the fertile valley of the Rio Grande from Brownsville to a great distance beyond El Paso. The opening of the port of Corpus Christi brought water transportation from 100 to 200 miles nearer this area than by way of the older Texas port.

Regular Service Is Established

Only recently a regular steamship service has been inaugurated between Corpus Christi and the Atlantic seaboard through the efforts of Robert Driscoll and Roy Miller. By the maintenance and development of such services the area served by the port will save millions of dollars annually in transportation costs. This regular coastwise service to Atlantic ports is operated by Moore and McCormack Inc. and was inaugurated on July 15 with the arrival of the COMMERCIAL PATHFINDER, from Philadelphia, bringing a varied cargo of merchandise to importers, wholesalers and jobbers in Corpus Christi and surrounding territory. Since that time this service has been operating on a semi-monthly schedule offering an important saving in transportation costs to importers in the south and southwest sections of Texas.

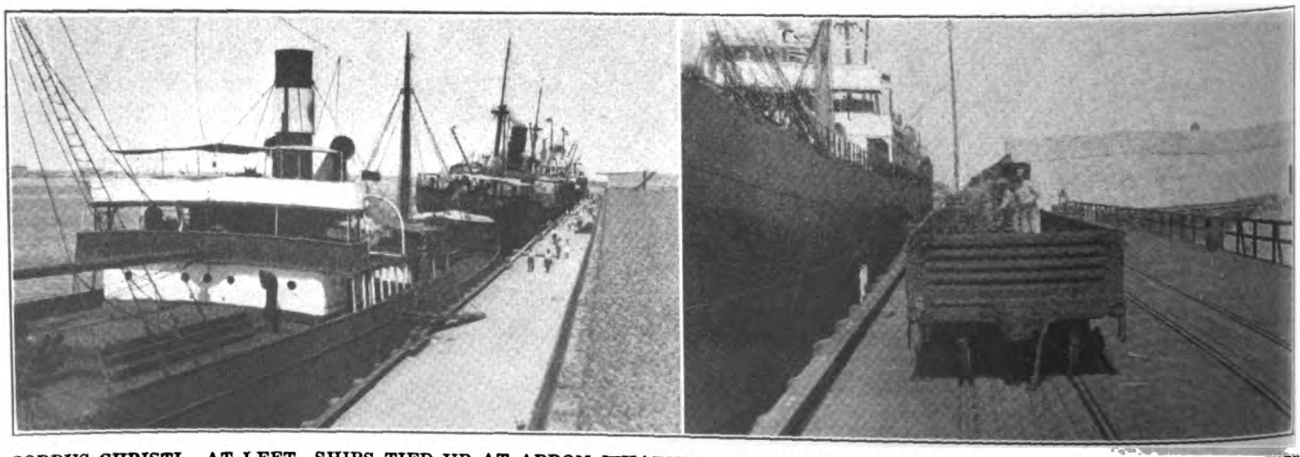
Cotton Chief Export Commodity

Shortly after the inauguration of this service the operator completed arrangements with the Mississippi-Warrior Barge line for shipping freight from St. Louis, East St. Louis, Granite City, Memphis and other points along the river, to the Port of Corpus Christi. By this arrangement freight for South Texas importers originating at these points may be delivered to ship's side in New Orleans via the Mississippi-Warrior Barge line. The coastwise vessels between Atlantic ports and Corpus Christi calling at New Orleans as a regular port of call, take such freight from the Barge line by direct transfer from barge to vessel for transportation to Corpus Christi and neighboring country.

In addition to growing imports of manufactured materials and the export of other commodities it is expected that cotton will develop into the most important of all products to be handled at the port of Corpus Christi. The Texas Farm Bureau Cotton Marketing association announced that it would concentrate at least 50,000 bales of cotton at the port for export to foreign markets. the cotton coming from 38 south Texas counties. Shortly after this the same association, representing the All-Russian Textile Syndicate Inc., following an inspection of shipping facilities, announced that it would export at least 50,000 additional bales of cotton from the new port. Shortly after this the S. S. LEERSUM loaded 14,000 bales of cotton for Murmansk, Russia.

New Industries

Most of the cotton shipped from Corpus Christi has been on vessels of the United States shipping board. General Dalton, manager of the Merchant Fleet Corp. in making a tour of inspection of the port a short while before the completion of its first year of existence predicted a great future growth and prosperity and that its harbor would become one of the most important in the entire South. He assured the port com-



CORPUS CHRISTI. AT LEFT—SHIPS TIED UP AT APRON WHARVES. AT RIGHT—UNLOADING STEEL INTO CARS ON OPEN WHARF

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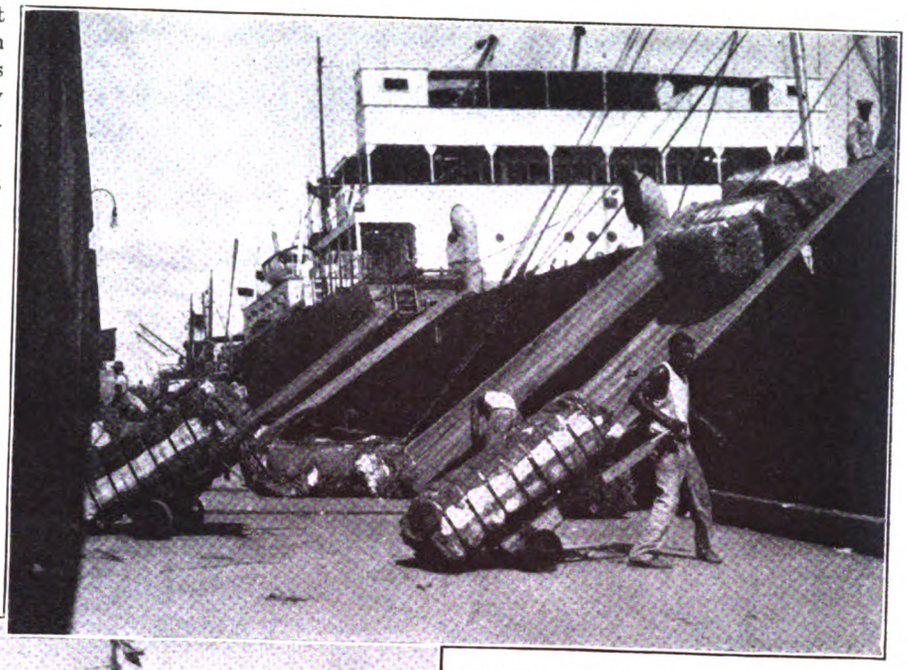
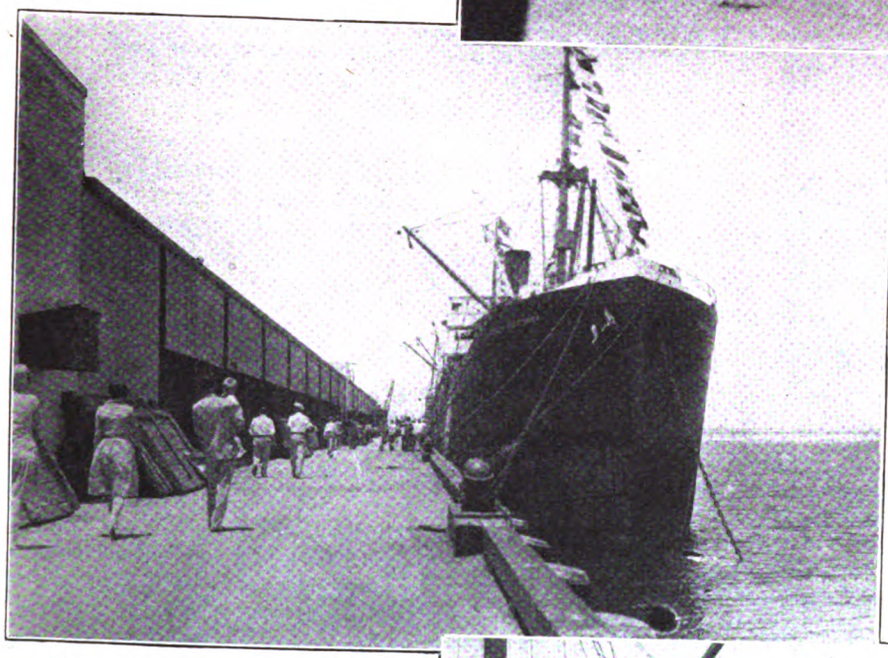
mission that the Merchant Fleet Corp. would send as many American flag vessels to Corpus Christi as might be necessary to handle any amount of cargo received for European shipment.

In keeping with the development of the port new and important industries are growing up around it. Some of these projects are completed and others are still in process of construction. One of the most important is the building of the Aransas Compress located at the port site. It is not yet entirely completed, though its present capacity is in excess of 50,000 bales of cotton. The equipment consists of two high density presses each capable of turning out 100 bales of cotton per hour. The Port Compress Co. recently com-



LOADING COTTON AT THE PORT OF CORPUS CHRISTI



DOCK SCENE LOOKING WEST

pleted the enlargement of its warehouses to a storage capacity for about 45,000 bales. There is sufficient trackage alongside its platform for 75 railroad cars to be stored.

Still another project for which the port is directly responsible is the construction of a $132,000 warehouse by the Corpus Christi Warehouse & Storage Co. Inc. This project is located on the land leased from the navigation commission and is but a short distance from the turning basin. When completed it will afford storage facilities for merchants of south Texas and for manufacturers and distributors in other sections of the country.

The commission having secured a responsible steamship service from the Atlantic seaboard is now negotiating for the establishment of a line from the Pacific coast. Officials of the Nueces County Navigation commission headed by Robert Driscoll are working constantly for the future development of the port and they believe that merchants, jobbers and others, receiving goods in the direct territory served by the port, will take advantage of the saving in transportation cost. Progress has been made and it has already been clearly demonstrated even in the brief period of its operation that the construction of an ocean port at Corpus Christi was well founded on economic grounds.

DOCK SCENE SHOWING WHERE APRON AND OPEN WHARVES MEET

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Personal Sketches of Marine Men

Gen. A. C. Dalton, Vice President and Gen'l Manager, Merchant Fleet Corp.

By L. M. Lamm

Photo by Clinedinst Studio

HE SERVED with distinction in all army grades from private to brigadier general, and for his work in the World war he received the distinguished service medal.

AS HEAD of the army transport service his training as an executive in charge of vessel property particularly fitted him for the difficult post he now holds.

UNDER his able management of the government owned fleet the service has been gradually improved and operating losses have been materially reduced.

"THE establishment of an American merchant marine, privately owned and operated, or partly government owned and privately operated under the American flag, is inevitable if we are to maintain our future prosperity and our influence as a world power," said Brig. General A. C. Dalton, vice president of the Merchant Fleet Corp., formerly the Emergency Fleet Corp., in discussing his attitude on the merchant marine question.

"History has repeatedly shown that nations have declined in their power and influence in the exact proportion in which their sea power had declined," he said.

When Elmer E. Crowley, president of the Fleet corporation resigned in July of last year, the shipping board was called upon to find a man to fill the position and they selected General Dalton, who at that time was assistant to the quartermaster general of the army.

General Dalton enlisted in the United States army in January, 1889 and continued in that service up to the time he accepted his present position. He was made a second lieutenant of infantry in 1891 and served in the grades of first lieutenant, captain, major, lieutenant colonel and colonel in the regular army until December, 1922. He was temporarily made brigadier general during the World war until December, 1922 when he was appointed assistant quartermaster general with the rank of brigadier general.

He acquired a great deal of practical experience in transportation and construction, including army transport service in the Cuban expedition in 1906 and the Vera Cruz expedition in 1914. In 1917 he was attached to the army organization overseas shipping depot at Philadelphia.

In the latter part of 1917 and 1918 General Dalton served as general superintendent of the army transport service at New York, including the supervision of activities pertaining to the chartering conversion, equipping and operation of vessels of the army transport service and allied water transportation activities, including the operation of docks, railway terminals, and storage facilities utilized by the embarkation service in the New York area.

From 1922 to 1924 he was chief of the transportation service of the quartermaster department of the army including the army transport service. General Dalton was also the war department representative in the hearings on the ship subsidy bill and he was assistant to Secretary of War, Weeks, in the work of the President's merchant marine committee in 1924. General Dalton was awarded the distinguished service medal for his work during the war.

"A majority of the United States shipping board felt," said Chairman O'Connor at the time General Dalton was appointed president, "that we required the services of a big executive trained in organization on a large scale, a man who had had long experience in important executive work. At the same time we wanted a man who had been actively engaged in ocean transportation. General Dalton seemed to us to fill the bill. His experience while in charge of the army transport service and in handling of water transportation during the war is common knowledge."

General Dalton has had a vast experience in con-

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OVER SIXTY-SIX YEARS IN SERVICE

To meet the ever changing—ever increasing transportation problems of New York Harbour, the very widest variety of marine equipment must be available to care for the stupendous tonnage that passes in and out of this Port annually.

—of which ship handling is not an unimportant part.

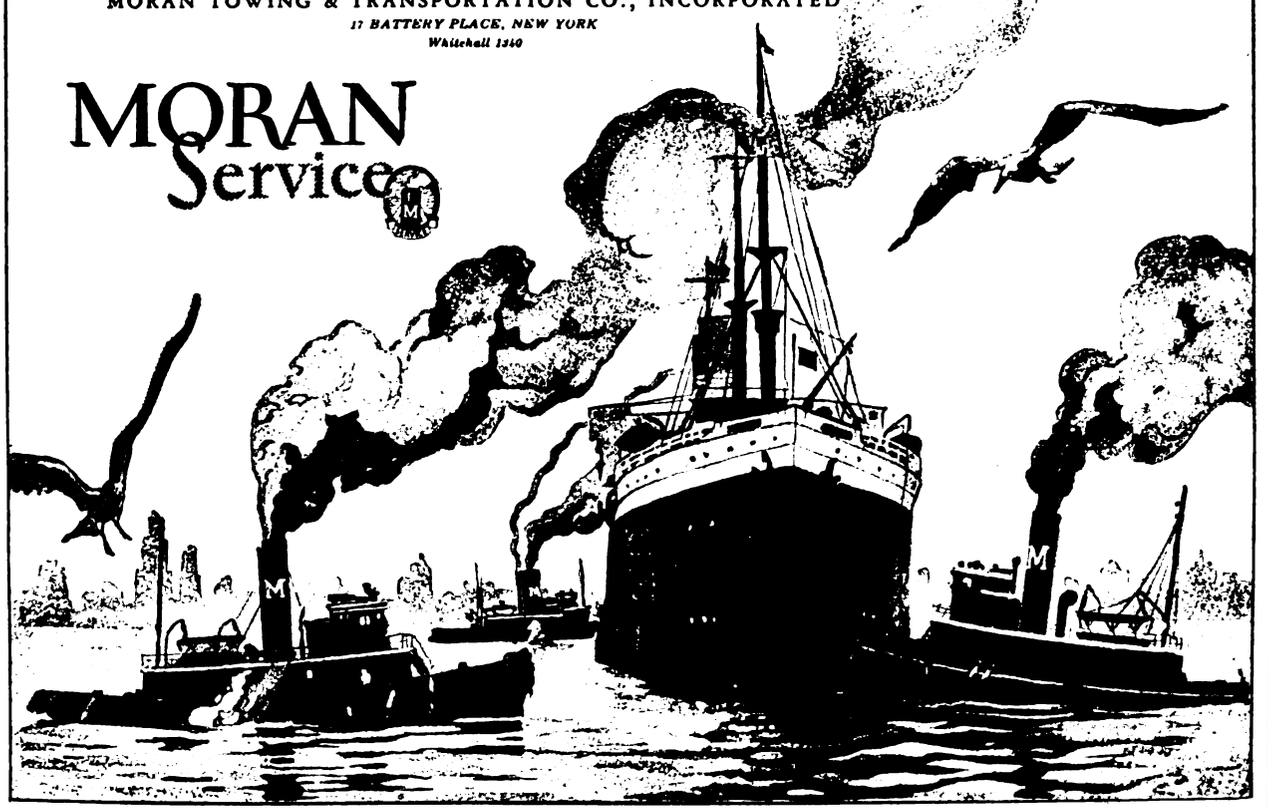
The availability of Moran Service for long and short distance deep-water and coastal towing, and the efficient handling and docking of trans-oceanic and coastwise craft is proverbial. An organization long schooled in the intricacies of the Port of New York and a wealth of equipment for both harbour and deep-water service, the Moran Company offers to owners and operators an incomparable day and night service that is unsurpassed for dependability and efficiency.

Fitting Into the New York Harbour Transportation Problem

Moran Marine Experts are gratuitously at the service of owners and operators for consultation and advice

MORAN TOWING & TRANSPORTATION CO., INCORPORATED
17 BATTERY PLACE, NEW YORK
Whitehall 1340

MORAN Service



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nection with the purchase of supplies and general business administration. His knowledge of and enthusiasm for a real American merchant marine are well known. He knows its commercial aspects and its value and relation to the country's national defense. In March, 1924, the President appointed a committee to study merchant marine affairs consisting of Secretary Mellon, Secretary Weeks, Secretary Wilbur, Secretary Hoover, T. V. O'Connor, chairman of the shipping board, and Leigh C. Palmer, then president of the Fleet corporation. General Dalton worked with this committee and demonstrated his ability in merchant marine problems. At the time of the appointment of General Dalton as president he was said to have had the support and approval of American shipping interests.

"The struggle by every nation to maintain its proper place on the high seas is as old as the nations themselves," said General Dalton, discussing the question with the writer, "and the influence of the nations today may be measured by the exact proportion in which they have been defeated in this struggle.

"I feel that the people of America will meet the present issue fully and at the same time fairly, and that we shall create an American merchant marine under the American flag, designed and built in American shipyards, manned and operated by American seamen, that will complete that final link in our great national transportation system and that will give us that commanding place on the high seas and our proper share in the world trade to which we, as a great people and a great nation, are justly entitled."

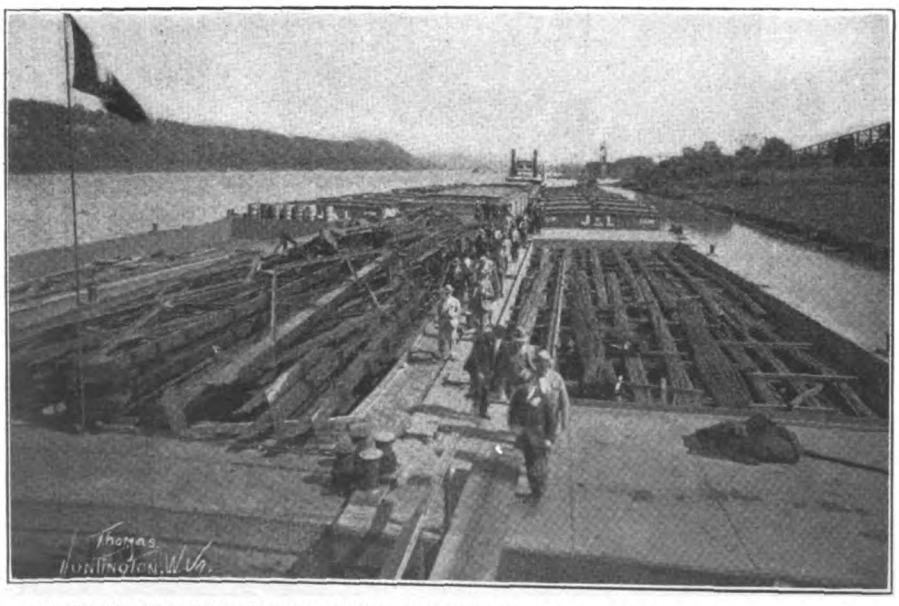
As the management of the Merchant Fleet Corp. is subject to the approval of the shipping board it was decided at a recent meeting to bring about a closer relationship between the two bodies by the formal election of Chairman T. V. O'Connor of the board as president and chairman of the Fleet corporation, with the commissioners as directors. General Dalton at the same time resigning as president, was appointed vice president and general manager directly responsible to Mr. O'Connor as chairman and the shipping board commissioners as a board of directors of the Merchant Fleet Corp.

This technical change in organization in no way affects the scope or authority of General Dalton in the conduct of the affairs of the Merchant Fleet Corp. and met with his full approval.

River Transportation Aids Industry

By J. F. Froggett

STRIKINGLY confirmatory evidence that the Ohio and Mississippi rivers are destined within a few years to become most efficient and exceedingly busy arteries for trade into the interior as well as the southern seaboard of the United States was given the Ohio Valley Improvement association at Huntington, W. Va., on Oct. 4 and 5. The 200 or more delegates from cities and towns in six states along the Ohio river personally inspected at the Huntington wharf a tow of nine barges, three of them covered barges of the Inland Waterways Corp. carrying damageable steel products, which were on their way down the rivers towed by the towboat WARREN ELSEY. The barges held 7000 tons of various steel products manufactured by the Jones & Laughlin Steel Co., Pittsburgh, and had started from that city a few days previously. The cargo included hundreds of tons of great steel beams for bridge and building material, tons of concrete reinforcing bars, wire, nails, rivets, etc. All the way down the rivers to New Orleans barges with certain products will be dropped at various cities such as Louisville, Ky., Memphis, Tenn. and so on down finally to New Orleans.



DISTRIBUTING PITTSBURGH STEEL BY WATER TO POINTS ON THE OHIO AND MISSISSIPPI RIVERS

When President Calvin Coolidge leaves Pittsburgh on a day in the autumn next year to open formally to inland waterway commerce the rejuvenated Ohio river, he having accepted the invitation of the Ohio Valley association to be its guest on this memorable trip, he will find only two locks and dams of the total 50 built by the government remain to be completed. And they will be ready for use in the summer of 1929. In fact, the government dredge HARRIS at this time is engaged in dredging a channel through the Mound City, Ill. bar which will form the connecting link between the last dam No. 53 on the Ohio river near Cairo, Ill. and deep water in the Mississippi river.

Completion of the entire Ohio river lock and dam project, which has been under way by the federal government for a quarter of a century at a cost that will exceed $100,000,000, will have been accomplished within two years, declared Col. C. W. Kutz, United States corps of engineers in charge of the Ohio river work. Detailed report was made to the convention by Colonel Kutz, showing that in 1928 two more dams and locks will be thrown open, and the remaining two in the following year. Each of these dams and locks cost the government around $4,000,000, the combined power dam-lock at Louisville now in course of completion, costing about $7,500,000.

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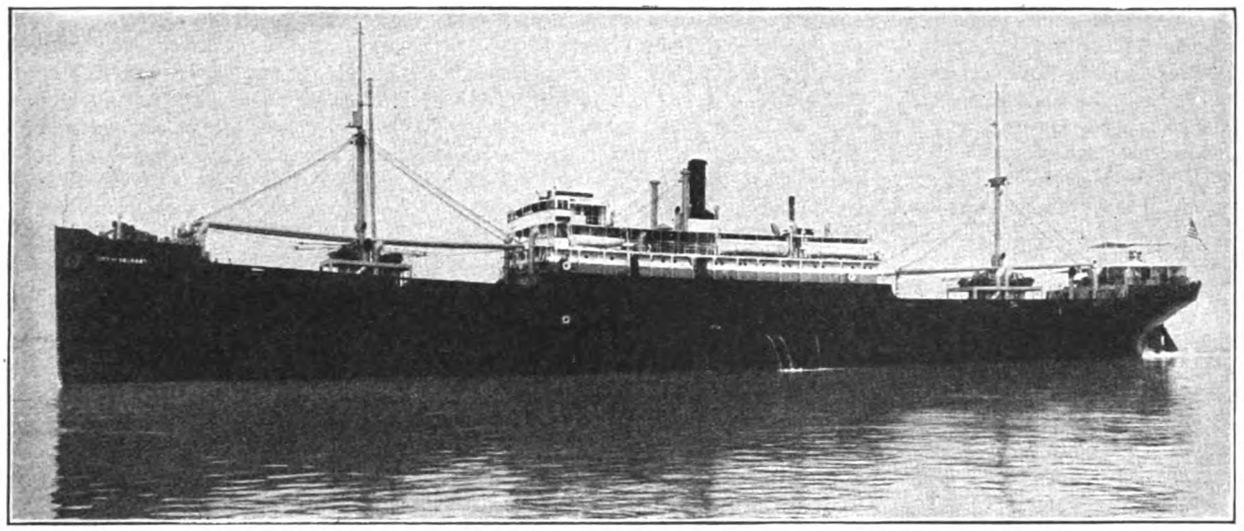

U. S. Shipping Board Motor Vessel "CITY OF DALHART" fitted with 6 cylinder, 2 cycle Busch-Sulzer 2900 H.P. Engine. This vessel is TEXACO lubricated, exclusively.

Converted Motor Vessels involve *new* lubricating conditions

Just as the modern motor vessel is supplanting the steam propelled ships of earlier days, so the present day marine engineer must change his oil specifications to conform to the new lubricating conditions involved.

Another thing, the first cost of the Diesel Engine is too great to disregard the importance of lubrication.

So it is well to state here the requirements of the ideal Diesel Engine lubricant:

To begin with,

1. It must lubricate thoroughly.
2. It must not form gummy deposits.
3. It must go through the separators easily and be readily reclaimed.
4. It must have a *low pour test* so as not to clog oil piping at low temperatures.
5. It must be of *proper viscosity* to meet bearing pressures.
6. It must maintain effective cylinder compression to assure *easy starting* and delivery of *full power.*

And finally:

7. The oil must be such that it can be depended upon for *uniformity.*

All these requirements are ideally met by

TEXACO URSA OIL

For Diesel Engines

Ask to see a sample of TEXACO URSA OIL—the Oil that was used on a 25,641 mile round trip "without one penny for engine repairs".

THE TEXAS COMPANY
Marine Sales Division
Dept. KN, 17 Battery Place, New York City
Offices in Principal Cities

Stocks Kept At Ports Throughout The World

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Major A. D. Ardery, district engineer at Huntington gave interesting Ohio river lock and dam operating costs. In 1926, he said, the tonnages handled on the Ohio river in that district cost the federal government 2/10 cent per ton mile, or 13 cents a ton for every ton carried on the Ohio. On the Great Kanawha river system it cost the government 29/100 cent per ton mile, or 13.7 cents a ton for every ton carried; on the Little Kanawha river, 27/100 cent a ton mile, or 12.7 cents a ton; and on the Big Sandy, 10.4 cents a ton mile, or 87½ cents a ton for every ton carried, this high cost being due to the shifting sandy bottom of that river which necessitated constant work upon it.

Maj. Gen. Edgar Jadwin, chief of engineers of the war department, quoted government statistics showing the growth of Mississippi valley traffic, in 1889 being 28,000,000 tons whereas in 1926 it had increased to 57,000,000 tons. Once it included beside coal, sand and gravel, also general freight; but now in addition moves vast tonnages of iron and steel, petroleum and other bulk freight via the river at great saving in transportation costs. He declared there is nothing speculative about these savings, they being as certain as annual returns on trunk line railroads. Such savings on the Monongahela river alone in a few years' operation have returned to shippers savings aggregating millions more than the sums the government has invested in locks and dams. He declared that the problem still remaining after the completion of the river work, is to work out with lateral railroads, bus and truck lines along the banks of the river, reciprocity of interests in conveying as feeders to the river the freight that originates back 75 to 100 miles inland.

Election of officers of the Ohio Valley Improvement association resulted as follows:

President, Capt. Oscar F. Barrett; secretary, W. C. Culkins; treasurer George Puchta; executive committee, Edwin C. Gibbs, chairman, W. C. Culkins, George F. Dieterle, Maurice J. Freiberg, R. P. Gillham, A. K. Nippert, Julian A. Pollak, George Puchta, and James A. Reilly, all of Cincinnati, and James T. Hatfield, Covington, Kentucky.

Who's Who in Diesel Electric Drive

By W. A. Thorpe

DIESEL electric drive is of vital interest to you if you are at all interested in water transportation. The reasons for its creation and subsequent rapid growth have been repeated so often that it seems that a brief summation is all that is necessary.

1. It uses the economies of the diesel engine; 2, it provides the most flexible power plant.

Under the above is found the opportunity to divide the power plant into a suitable number of units to provide greatest economy under varying conditions and at the same time increase reliability.

The ability to connect an electric motor to the propeller shaft and secure any predetermined range of speeds, forward or reverse, instantly is of great value. With the control of the motor placed in the pilot house the system is adapted for very severe maneuvering conditions.

The above are claims which can have little merit without substantial proof. It is therefore only proper to enumerate those who have made a study and been convinced to the point of installing such equipment: 1, many yacht owners; 2, Atlantic Refining Co.; 3, New York Central railroad; 4, Long Island railroad; 5, Pennsylvania railroad; 6, United States Engineers Corp.; 7, Panama canal; 8, Construction Materials Co.; 9, Standard Oil Co. of Calif.; 10, Standard Oil Co. of N. J.; 11, Southern Pacific railroad; 12, Wilmington Transportation Co.; 13, Golden Gate Ferry Co.; 14, General Petroleum Co.; 15, Middlesex Transportation Co.; 16, United States coast guard service; 17, Atlantic Transit Co.; 18, United States Steel Products Co.

The above is only a partial list; but it is at once apparent that the list of owners represent a large and substantial group of soundly managed companies with most competent engineering staffs.

The diversification of service is such that diesel electric drive is in daily and successful operation in all parts of the world. Just review the services of some of these ships and where you will find them:

The Atlantic Refining Co., tankers, around Philadelphia or in Europe or Africa; the coast guard cutter probably in Alaskan waters; the Standard Oil Co. of California, tankers, around California, up at Alaskan ports, west coast ports and around the Hawaiian islands; the Wilmington Transportation Co. tugs at Los Angeles; the Panama canal tug boats in the Zone; the Port of Houston fireboat at Houston, Texas; the Golden Gate Ferry Co. and Southern Pacific and Northwestern Pacific railroad ferry boats in San Francisco harbor; the Standard Oil of N. J. tanker plying down the Atlantic seaboard; the United States Engineers Corp., dredges and towboats found on the coast and along the Mississippi and its tributaries; the United States Steel Products Co. vessel plying the Great Lakes, canals and St. Lawrence; the Construction Materials Co., dredge bringing material into ports of the Great Lakes for building purposes; the many tugs of the New York Central, Pennsylvania and Long Island railroads are busy with tows of barges or running light in New York harbor; the many yachts with this type of drive may be found any place in the world.

With such a list of owners, so many classes of service and in so many localities, diesel electric drive has proven its merit and will continue to grow.

For this growth the General Electric Co. has furnished a large number of units and is now manufacturing others.

The author, W. A. Thorpe, is a member of the staff of the Marine Department of the General Electric Co. This article was prepared at the request of the Editor.

Drydock for Oakland

The General Engineering & Dry Dock Co., Alameda, Calif., is preparing to start construction of a new floating drydock to accommodate ships of 15,000 tonnage. Plans and specifications are completed according to Geo. Armes, president of the company.

On Oct. 2, the new turbo-electric, self-unloading steamer, CARL D. BRADLEY of the Bradley Transportation Co. sailed from Calcite, Mich. for Buffington, Ind. with a cargo of 15,724 tons of stone which establishes a record. The L. E. Block on Aug. 28 loaded 15,622 tons of stone at Calcite for Indiana Harbor.

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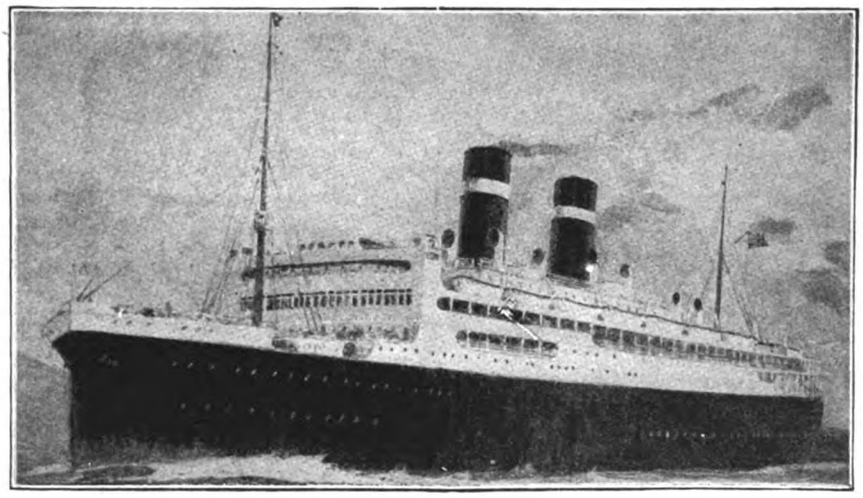


S.S. California

Smart Looking

- ▣ -

Built to wear--- "LIKE A BATTLESHIP"

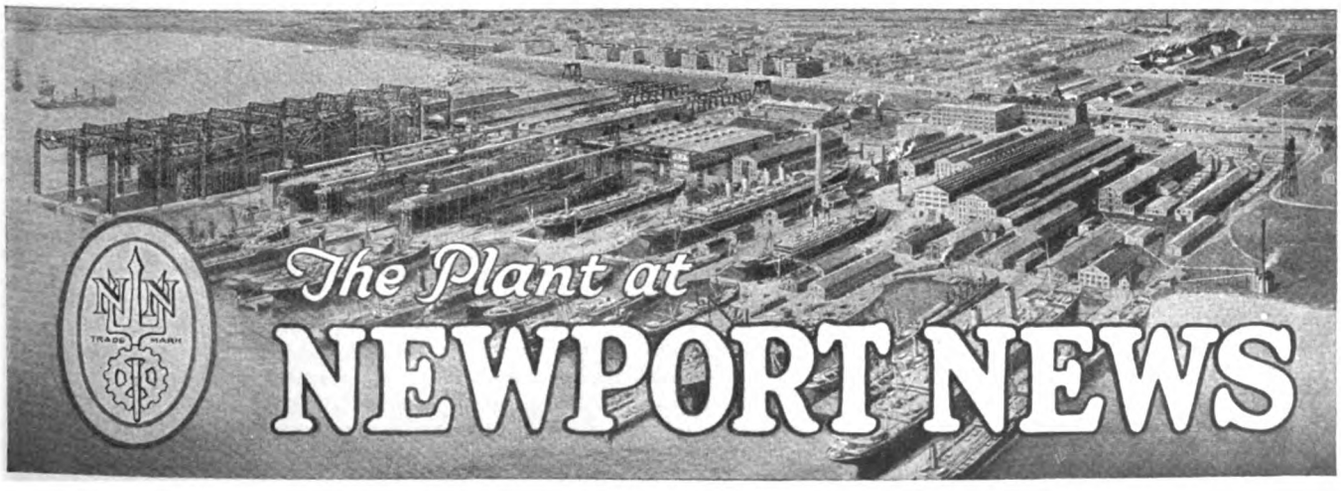
S.S. California, largest merchant ship ever built in the United States, launching October 1, is in every respect comparable to the finest transatlantic ships now in service. She will run between New York and California ports, her turbo-electric drive giving a speed of 18 knots.

Newport News Shipbuilding and Dry Dock Company ranks as one of the finest organizations in the world, in facilities for construction and repairs.

Our yard facilities are unequalled, labor is plentiful and good, and the climate permits outdoor work the year 'round.

If you desire fine ships, or are in need of quick dependable repair service, our Engineering staff will be glad to consult with you—without cost or obligation.

NEWPORT NEWS SHIPBUILDING AND DRY DOCK COMPANY
NEWPORT NEWS, VIRGINIA, U. S. A. - NEW YORK, 233 BROADWAY



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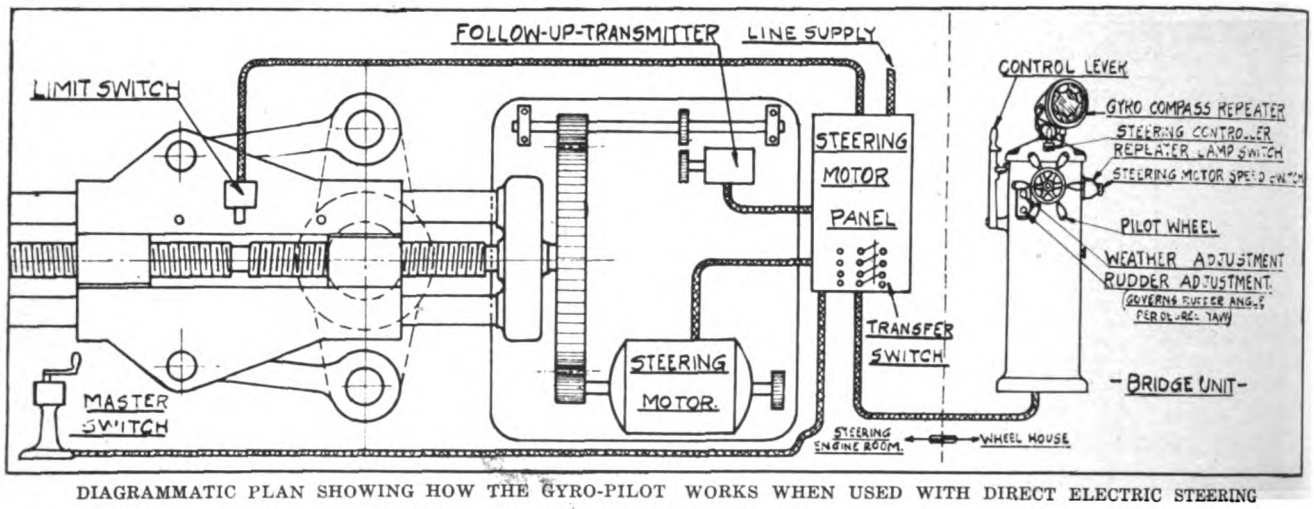

DIAGRAMMATIC PLAN SHOWING HOW THE GYRO-PILOT WORKS WHEN USED WITH DIRECT ELECTRIC STEERING

Modern Steering

(*Continued from Page* 64)

rate three completely independent means of steering, i.e. automatic, manual by wheel and manual by controller.

The steering motor on these vessels is controlled from the wheelhouse unit through a contactor panel installed in the steering engine room, providing two speed control and automatic acceleration. The control from the steering unit is also arranged to slow the steering motor down just before it is stopped, thus permitting very rapid applications of rudder without the shock of stops and reversals.

Hand and Automatic Steering

Basically the operation of this equipment is very simple. In the wheelhouse unit a gyro-compass repeater motor moves a contactor arm, which carries a roller contact member around inside of a contactor ring which carries an insulated segment. As the ship changes course a fraction of a degree this roller contact is carried off of the neutral segment making a contact on one side or the other. This in turn, through relays, starts the main steering motor putting the rudder over in the proper direction. The follow-up transmitter, operated from the main steering motor, operates the follow-up motor, in the wheelhouse unit, turning the contactor ring in the direction of the roller contactor until the insulated segment catches up with it and stops the steering motor. As the ship swings back to her course the same procedure takes place in the opposite direction. There are provisions for introducing variables for such as weather and the amount of rudder per degree off the course.

When steering manually on the gyro-pilot by means of the wheel, the roller contactor is moved directly by the small hand wheel and the other operations are practically the same as when steering automatically. The ratio of wheel to rudder motion is the same as in the average steering equipment.

A frequent requirement of the naval architect now is a combination stand in the wheelhouse to house both the hand and automatic steering equipment, especially where the vessel is to have a system of shaft steering. This is accomplished by bringing the shafting up to a bevel gear and out to a large wheel on a quill shaft, through which the gyro-pilot wheel shaft is brought out.

An equipment has also been recently supplied, installed and is now in service, which incorporates hand and automatic steering and the controls for the main drive motors. This equipment makes an odd looking wheelhouse indeed as the familiar Chadburns, magnetic compass and conventional steering stand had become a part and parcel of every wheelhouse in fact, song and story.

The ship of the future may have a conventionally shaped bridge but the old bridge fittings will be missing.

From the Editor's Mail

To the Editor:

I have read with interest and keen appreciation Capt. George S. Laing's excellent article published in the August MARINE REVIEW and reproduced in the *New York Sun*, Sept. 28.

I heartily approve of the gallant captain's recommendation that—"A picture of a square-rigged sailing vessel should be hung up in every school in the United States and throughout the British Empire, for it was due to this type of craft and her indomitable crews that these nations became great upon the trade routes of the globe."

American school children upon finishing their school studies have a passable knowledge of "dry" geography, but their lack of knowledge of the seven seas, the great ocean trade routes, and the tremendous volume and value of water-borne commerce is truly lamentable, and it is equally regrettable that this ignorance is quite generally shared in the present day by grown-up people as well.

No period in American history has made a larger contribution to American wealth and commerce than that of the clipper ship era, and during this period the name of Donald McKay, the talented designer and builder of many of the most graceful and fastest sailing clipper ships, became known throughout the civilized world.

The Boston School committee has done honor to this great marine architect by naming one of its modern school buildings in East Boston the Donald McKay Junior High School. Near the location of this new school about 75 years ago the FLYING CLOUD, SOVEREIGN OF THE SEAS, GREAT REPUBLIC, and a score of other swift and graceful ships were launched from the Donald McKay shipyards.

France has recently honored his genius by placing his portrait in the marine section of the Louvre.

He not only made a great contribution to commerce in times of peace, but placed his shipbuilding plant and untiring effort and energy at the disposal of the United States government, resulting in unestimable service to the navy and war departments during the Civil war. The name of Donald McKay is deserving of a place in the American Hall of Fame.

Will you please convey my felicitations and thanks to Captain Laing for his interesting and excellent articles.

C. W. D. Coffin

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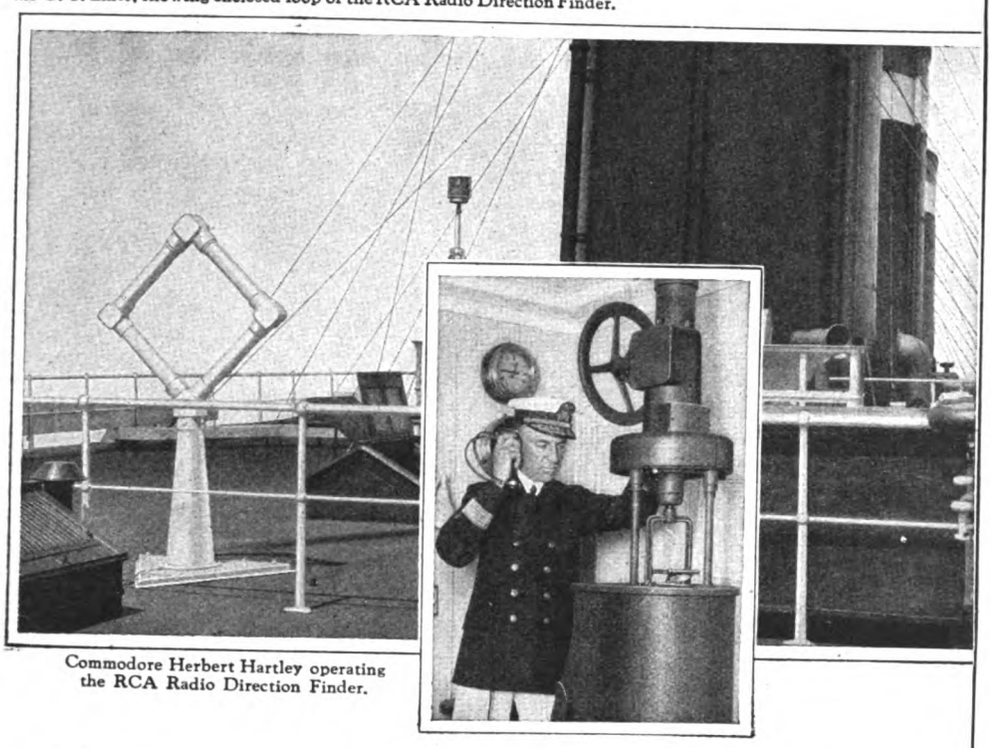
View of the deck above the chart room on the S. S. Leviathan, flagship of the U. S. Lines, showing enclosed loop of the RCA Radio Direction Finder.



Commodore Herbert Hartley operating the RCA Radio Direction Finder.

Commodore Hartley praises RCA Radio Direction Finder

"We have found the RCA Radio Direction Finder to be accurate and satisfactory in every way"

(signed) Herbert Hartley

RCA Radio Direction Finders have been installed on the vessels of forty-one steamship companies and four U. S. Government departments operating vessels on the Atlantic, Pacific, the Great Lakes and the Gulf. The captains of these vessels all agree that the RCA Radio Direction Finder is as accurate in fog or storm as sight bearings on clearest days. Its durability and performance are guaranteed by RCA.

We will be glad to take up with you in detail just how the RCA Radio Direction Finder will afford your ships greater safety and speed up running schedules between ports.

Baltimore
Washington, D. C.
Chicago

Boston
New Orleans
Norfolk, Va.

RCA

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San Francisco
Los Angeles

Cleveland
Seattle
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Honolulu, T. H.

MARINE RADIO

RADIO CORPORATION OF AMERICA ~ *Marine Department* ~ 66 Broad St., N. Y. C.

Sixteen distinctive features of the RCA Radio Direction Finder:

1. Eight-tube Super-Heterodyne receiver, using UX-201-A tubes, giving maximum sensitivity and selectivity.
2. Enclosed loop. Loop enclosure and support constructed entirely of non-corrosive silicon aluminum.
3. Wires in loop are shielded by metal covering from the effects of stacks, stays, masts and other metal objects. This improves accuracy in readings.
4. Mechanical compensator. Permits direct readings without reference to calibration chart or correction curve.
5. Reading glass magnifies scale on the compass card, enabling bearings to be read with greater speed and accuracy.
6. Exide battery, which is automatically trickle-charged when receiver is not in use. The only attention required is the addition of water about once in six months.
7. Compass card engraved with both degrees and points of the compass. Illuminated by electric light at night.
8. Automatic signal to radio room to notify operator to open antenna switch, and positive inter-lock between opening of antenna switch and direction finder through a relay in the direction finder filament circuit. This device assures accuracy.
9. Special balancing device permits readings which fall to absolute zero within one degree, so that even an unskilled person can read bearings with accuracy.
10. Vertical hand wheel in the chart room operates loop easily—even during a heavy gale or violent pitching and rolling of the ship.
11. Ball-bearings are used throughout on the loop drive shaft and control wheel.
12. Highest quality materials and workmanship throughout give the instrument a fine appearance and assure long life and minimum maintenance.
13. Variable sensitivity permits bearings on distant stations or nearby stations as desired.
14. Bearings may be read over a dumb compass or Sperry Repeater. These units are interchangeable.
15. Receiver controls mounted on a slanting panel afford easy manipulation of the receiver. The control panel is illuminated for night use. Station selector dials are calibrated in meters so that the operator can turn quickly and accurately to the wave length desired. Receiver control panel is provided with a cover equipped with a lock so that the entire instrument, including the receiver controls, can be locked to prevent tampering by unauthorized persons. Closing the receiver cover automatically turns off the tube filaments and puts battery on trickle charge. This is another means of assuring that the battery will be fully charged at all times.
16. The RCA Radio Direction Finder is backed by the name and reputation of the Radio Corporation of America—your assurance of the finest instrument obtainable.

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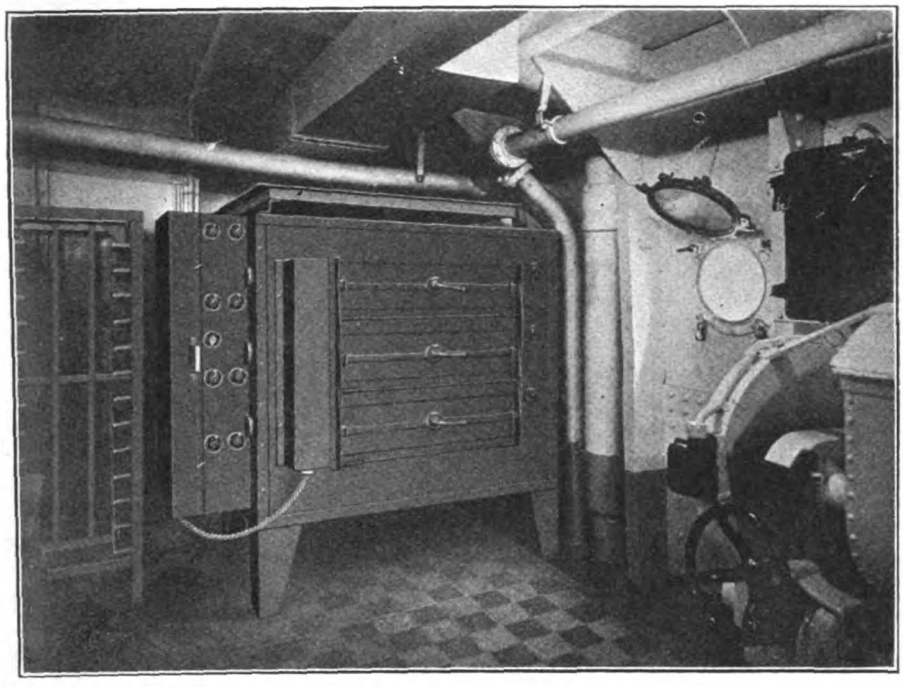
Cook by Electricity

(*Continued from Page* 63)

results have been better and cheaper operation.

It has usually been found to be cheaper to use oil or other fuel for the generation of electric current and then use electric current in its various applications for auxiliary purposes. The cost to produce electricity varies from as low as .3 cent per kilowatt per hour in the case of large vessels where special diesel units are coupled to generators, to ½ cent and 1 cent per kilowatt per hour for smaller units.

One of the strong arguments for use of electricity for cooking and baking on board ship is that it is largely off-peak. Losses from waste heat make steam heating expensive and the absence of such losses make electric heat relatively more efficient. This also applies to electric cooking for both heating and cooking are excellent uses for spare electric power. Use can be made also of storage batteries which, when charged by the generator when the load is light, will give back sufficient power to help out when there is a peak load. In fact, it will even permit the generator set to be shut down entirely at intervals.



ELECTRIC 180-LOAF BAKE OVEN IN THE BAKERY OF THE S. S. MALOLO

Electric Galley on the Malolo

In the main galley on the S. S. MALOLO there are eight heavy duty ranges of 22 kilowatts each, equipped with the previously described heating unit. There are two banks of four each, placed back to back in the form of an island installation, thus making for economy of deck space and convenience of operation for the chef. This is possible as there are no difficult ventilating problems caused by smoke, gases and fumes. Each range has four individually controlled units, giving the effect of four stoves in one. Each unit has three heats so that it can be operated at either 4 kilowatts, 2 kilowatts or one, depending upon the use desired. Each unit is also separately fused and is operated by a reversible rotary snap switch.

There are also two large broilers of ten kilowatts each with adjustable grids located below the heating unit and equipped with grease funnels and warming compartments.

The construction of this equipment is of great strength, heavy sheet steel being used throughout, welded and braced. The framework of the ranges is designed to carry a steel top 48 inches long x 39 inches deep, which is equipped with sea racks. The hotplates are independently supported on the frame work so that the weight of the cooking utensils does not come on the range top, but on the frame work itself. Each hotplate has been designed to carry the weight of 1000 pounds during operation at cherry red heat and will not warp nor sag, which means always an even cooking surface.

The range ovens are 21½ inches wide x 26½ inches deep x 18 inches high with the walls and oven door insulated. The oven is equipped with top and bottom heating units of 3000 watts each and independently controlled by three-heat, heavy service, rotary snap switches, the heating units covering the top and bottom areas of the oven.

The crew's galley of the MALOLO has two sections of the same type of range as that used in the main galley.

It is surprising to note all of this range and broiler equipment, having a capacity to cook for 1200 persons daily, occupies only 148 square feet of deck space.

Bakery and Pastry Shop

In the bakery and pastry shop are two, three-deck electric ovens, one of 25 kilowatts for bread and one of nine kilowatts for pastry. The design of these ovens is similar except for capacity. The heating compartments are tiered, one above the other, with a top and bottom heating unit in each compartment, thus enabling each to be, in the true sense of the word, a separate baking chamber. This enables the greatest diversity of baking as well as economy of operation.

Linings of these ovens are heavy steel, surrounded with rock wool insulation, this having been found by elaborate practical and laboratory experiments to be the most efficient and durable insulation for this purpose. In addition, there is a minimum of through metal from the lining through the insulation to the outer wall, thus reducing heat losses to a minimum, further increasing the high percentage of economical operation.

Other Electrical Appliances

Each baking compartment has a deck of heavy 1-1/8-inch tile which acts as a heat reservoir, maintaining temperature with low consumption of electricity. There are bi-metallic temperature thermometers for each compartment and the decks are illuminated so that each part of the baking chamber is fully visible. The doors are of the shelf-type with a latching mechanism which is so designed so as to make the baking chamber steam tight when the doors are closed. The 25-kilowatt oven has a capacity of baking 270 one-pound loaves per hour and the pastry oven has a loading capacity of six 18-inch x 26-inch roll pans. These two bake ovens have 34 kilowatts connected load but occupy only 41 square feet of deck space. They will do all of the baking on the MALOLO for a capacity of 1200 persons to be fed daily.

(*Continued on Page* 82)

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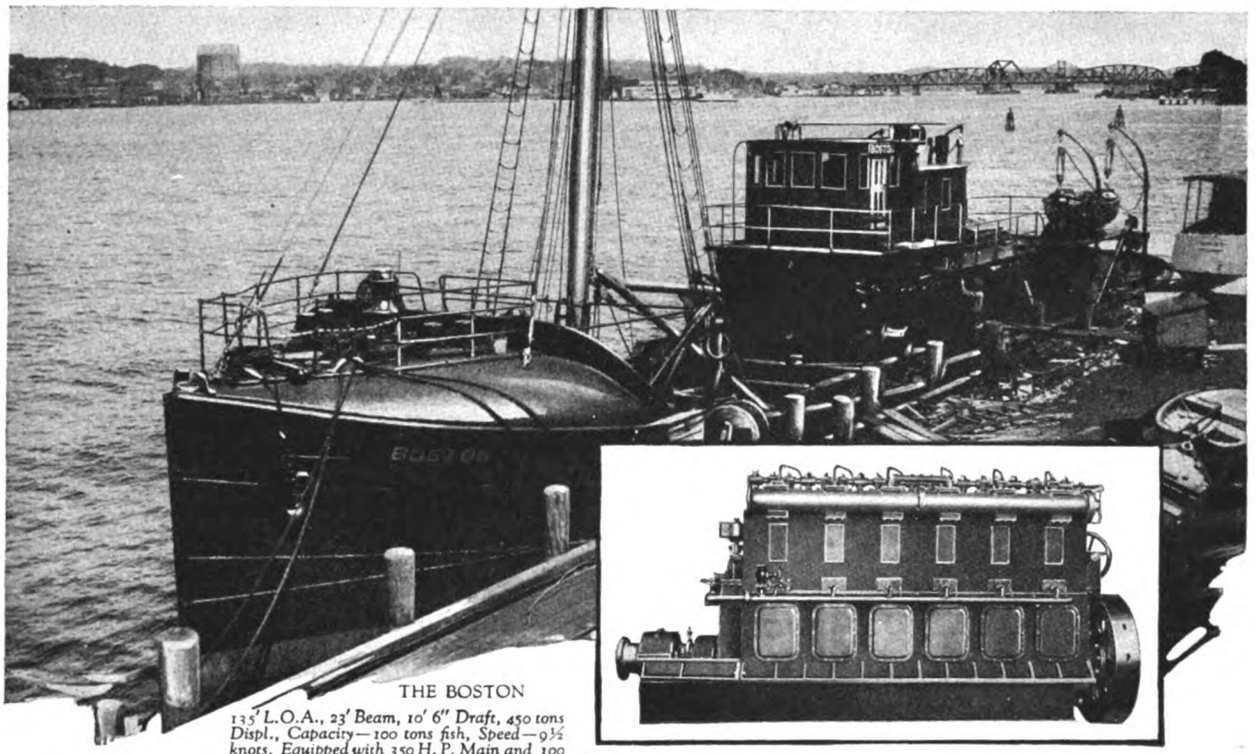

THE BOSTON

135' L.O.A., 23' Beam, 10' 6" Draft, 450 tons Displ., Capacity—100 tons fish, Speed—9½ knots. Equipped with 350 H. P. Main and 100 H. P. Auxiliary Nelseco Engines. Owners—Massachusetts Trawling Co., Boston, Mass.

Larger Net Profits

out of the same size nets

THE trawler Boston, owned by the Massachusetts Trawling Company, runs to the Grand Banks and returns with a cargo of cod and haddock. Converted last year to Diesel propulsion, this vessel has steadily yielded larger net profits than was possible when operating as a steamer.

For the Nelseco Diesel cuts the operating cost of every vessel in which it is installed. In many cases it does the same work at a fuel cost of from 15% to 20% of the fuel cost of the steamer.

Economy and dependability of operation—that is the chief reason why so many ship owners are equipping with Diesels—especially with Nelseco Diesels. Nelseco is the licensee of the M. A. N. Company of Germany, in whose plant Dr. Rudolph Diesel worked out his original engine. Nelseco Diesels are built with mechanical injection of fuel oil, which makes operation even more economical and dependable.

Long after the Diesel savings-per-trip have paid for the installation, they will keep on paying larger dividends every time your ship leaves port. Complete information on Nelseco engines will be forwarded on request. Write for Pamphlet MR.

NEW LONDON SHIP & ENGINE COMPANY
Groton, Conn., U. S. A.

Chicago Representative
H. JACOBSEN
25 North Dearborn Street

New York Sales Office
247 Park Avenue, New York City

West Coast Representative
KING-KNIGHT CO.
Seattle, San Francisco, Los Angeles

NELSECO

Original licensees from and collaborators with M.A.N. since 1910

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Purification of Oil

(*Continued from Page* 61)

trouble from this source.

Until very recently the smaller marine units have not generally been able to enjoy the protection of centrifugal lubricating oil purifiers. Although smaller centrifugals have been available they have not been designed specifically to meet the needs of diesel operation. The Sharples Speciality Co. has spent considerable time and thought in the development of a centrifuge adaptable to this service. It may be attached directly to the engine, has a self-contained motor drive and is constructed to operate continuously with a minimum of care and attention. It is sturdily constructed and easily cleaned. This machine is directly in line with the present trend toward the universal use of oil purifiers so that protection may be secured for internal combustion engines of any size whatever at a cost commensurate with the investment in the engine itself.

Need Diesel Vessels

(*Continued from Page* 13)

which is, that when completed these vessels will have a deadweight of about 10,500 tons and will make a speed of 13 to 14 knots, making them the equal of the best merchant vessels afloat today.

Private building of diesel engine ships in the United States has not taken on as it has abroad. A careful analysis of all new shipbuilding in the United States during the last calender year showed that diesel as primary power was used in 47.9 per cent of all steel merchant vessels over 100 gross tons or 100 feet in length in some stage of construction during that period. This percentage approaching that for diesel engine vessels under construction the world over, does not however, tell the whole story. Many of the vessels in which diesel engines were installed in the United States were of the smaller sound bays and river craft and special craft. Eliminating these the proportion of diesel engine vessels would drop to the low figure of about 13 per cent. There was of course in addition to new building a number of private conversions from steam to diesel.

The plain fact is that the diesel engine has not so far made any headway to speak of for use as propulsive power in American domestic vessels and our privately owned overseas merchant marine is extremely limited and is not being added to by building in American yards. Though our domestic shipping business is extensive and is constantly growing the number of additions to this fleet is limited. The increased use of the diesel engine for American privately owned ships will have to depend, first, on making the private American operator engaged in domestic shipping realize that by adopting the diesel engine he can lower his operating cost to such a point that considering the initial cost he will receive a greater return on his investment; second, in the possibility to building up a privately owned American merchant marine for the overseas trade to carry a fair share of our own commerce. In this field the American operator meeting foreign competition will be compelled as a matter of self-preservation to adopt the most efficient type of propulsion machinery.

Foreign owners and their technical advisors have faith in the degree of mechanical perfection of the diesel engine in its present state of development and in the commercial superiority of vessels so engined. That such faith is not limited to a certain class of vessels only, such as long voyage

Naval Architects Meet in New York Nov. 10-11

THE Society of Naval Architects and Marine Engineers will hold the thirty-fifth general meeting of the society at the Engineering Societies building, Twenty-nine West Thirty-ninth street, New York city, Thursday and Friday, Nov. 10 and 11, 1927. Fourteen technical papers will be presented at the professional sessions which will begin each day at 10 a. m. The council of the society will meet at 3 p. m. Nov. 9 in the board room on the fifteenth floor of the Engineering Societies building, through the courtesy of the American Society of Civil Engineers.

Following a long established custom the banquet will be held at 7:30 p. m. on Friday, Nov. 11, in the grand ballroom of the Waldorf Astoria hotel. Immediately preceding the banquet there will be a reception beginning at 6:30 p. m. The titles of the papers, their authors, and the order in which they are to be delivered follows:

THURSDAY, Nov. 10, 1927

1. *"Car Float Strength and Deflection,"* by Prof. Evers Burtner, member, and Richard H. Tingey, visitor.

2. *"The Design of Superstructures for Large Passenger Ships,"* by Carl E. Petersen, member, and Lorentz Hansen, visitor.

3. *"The Wampanoag, the Fastest Ship in the World,* 1868," by James Swan, member.

4. *"The Submarine of Today,"* by Lawrence Y. Spear, member.

5. *"Model Tests with Adjustable Blade Propellers,"* by Capt. William McEntee, C. C., U. S. N., council member.

6. *"Tank Steamer Fires and Explosions,"* by Robert L. Hague, member.

7. *"What is Naval Aviation Doing,"* by Capt. Emory S. Land, C. C., U. S. N., member.

FRIDAY, Nov. 11, 1927

8. *"Test of Pulverized Coal as Applied to Scotch Marine Boilers,"* by Carl J. Jefferson, member, and Commander Joseph S. Evans, U. S. N., visitor.

9. *"Pulverized Coal Tests of a Marine Water Tube Boiler,"* by Thomas B. Stillman, member.

10. *"Test of a Two-Cycle Double Acting Marine Diesel Engine,"* by Ernest Nibbs and Stephen A. Gardner, members.

11. *"Diesel Engines for the Navy,"* by Edward C. Magdeburger, visitor.

12. *"The Engines of the U. S. Shipping Board Diesel Conversion Program,"* by Capt. Richard D. Gatewood, C. C., U. S. N., member.

13. *"Modern Trend of the Diesel Engine with Respect to Low Weight per Horsepower, High Revolutions Per Minutes and High Mean Effective Pressure,"* by Otis D. Treiber, member.

14. *"Vibration and Engine Balance in Diesel Ships,"* by Prof. Frank M. Lewis, member.

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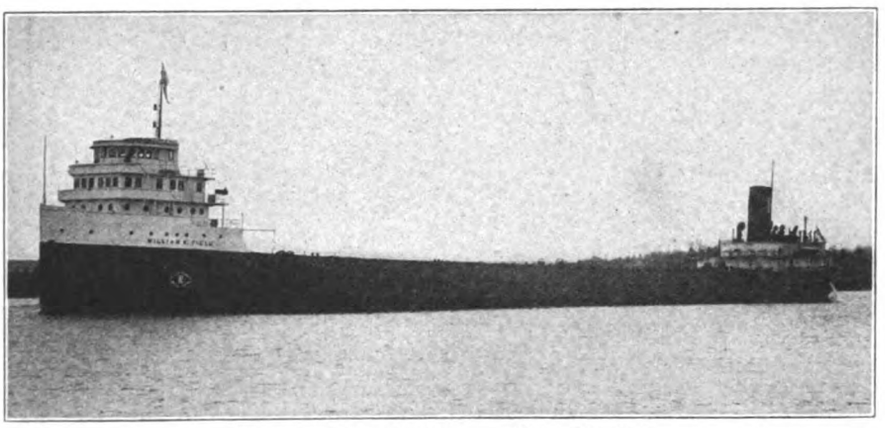
Toledo Shipbuilding Company Inc.

TOLEDO - - - OHIO

Builders of the World's Record Cargo Ship



Steamer William K. Field

604 ft. Long, 60 ft. Beam, 32 ft. Depth. Deadweight Tonnage 12000.

OVER half a million tons of freight carried—forty six cargoes of ore and coal delivered in seven months and seventeen days by the steamer William K. Field.

This remarkable performance earned her the title, "Champion Freight Carrier of the World". During the season 1924 on the Great Lakes she registered a total of 552,014 tons. *An unprecedented accomplishment!*

The William K. Field is owned and operated by Reiss Steamship Company, Cleveland, Ohio. Her type of construction permits rapid loading and discharge of cargo. This was an important factor in her record breaking performance.

Builders and Repairers of Ships and Engines

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freighters, is clearly indicated by the recently completed 19-knot, 24,000-ton, twin screw, passenger motor liner, SATURNIA illustrated at the head of this article. This vessel was built for the Trieste-Buenos Aires service of the Cosulich line by the Stabilimento Tecnico Triestino and is engined with two 10,000 brake horsepower, double acting, heavy oil engines. A sister ship, the VULCANIA is also nearing completion.

The SATURNIA is a magnificent passenger liner, with luxuriously appointed accommodations and furnishings and is fitted to carry 2191 passengers, 441 crew, and 4600 tons of cargo over half of which may be refrigerated. On her sea trials which were held out of Trieste, Sept. 18, she behaved in a very satisfactory manner and there was absence of any serious vibration. During this trial she ran easily at approximately her service speed of 19 knots. This wonderful vessel, a monument to the courage of her owners and the skill of her builders, sailed Sept. 21 from Trieste bound for Buenos Aires on her maiden voyage.

Convert Three Vessels to Diesel Electric

The shipping board on Oct. 13 directed that contracts for converting the steel cargo steamships, COURAGEOUS, DEFIANCE and TRIUMPH to diesel electric motor ships be awarded the Federal Shipbuilding & Drydock Co., the Norfolk navy yard and the Boston navy yard, respectively. By means of the conversion the speed of these vessels will be advanced from approximately ten knots to an estimated speed of between 13 and 14 knots loaded. The vessels are 468 feet 6 inches in overall length and have a draft of 27 feet 4 inches and a displacement of 15,140 tons.

The amounts of the contracts are as follows: COURAGEOUS $1,319,000; DEFIANCE, $1,192,000; and TRIUMPH, $1,315,000. The highest bid received was $1,666,156. These figures are about 60 per cent of the estimated cost of constructing new vessels of this type in American ship yards, and are less than the cost of constructing similar high-speed freight ships in foreign ship yards. Thus by the conversion of these vessels, three new motor ships, suitable for competition with the new motor ships built for foreign flag operation, will be provided for the American merchant marine. Work will be commenced as soon as practicable.

The vessels will be equipped with four McIntosh and Seymour diesel engines of 1200 horsepower each, the cost of which is included in the contract prices. The prices given also include certain modifications of the ships' hull lines in order to aid in increasing the speed of the vessels. As converted the ships will be of 10,500 deadweight tons each, and each will have 600,000 cubic feet of cargo space.

The plans for converting these vessels have been perfected under the direction of William Francis Gibbs, naval architect of New York, and Rear Admiral D. W. Taylor, U. S. N., retired. Mr Gibbs and Admiral Taylor have also re-designed the hull lines of these ships, receiving the co-operation of the navy department in making experimental tests of models

Cook by Electricity

(*Continued from Page 78*)

In addition to the major equipment above described there are a number of smaller appliances including electric griddles, urns and hotplates for the main pantry and stewards pantry service. These add to the convenience of the chef and food service perfection.

The total electric galley equipment on the MALOLO has a connected load of 220 kilowatts which will amount to approximately 35 per cent of the total electrical demand. The equipment will operate during what might be termed the off-peak period, previously mentioned. This is possible because the baking is done mostly after midnight and in the early morning hours. Much of the heavy cooking will be done from early morning to late afternoon and by the time the lighting load comes on, practically all of the cooking is out of the way, with a resulting favorable diversity factor which equalizes the load on the generators.

Controls for Galley Equipment

There is a separate switchboard panel controlling the galley equipment which will have a separate metering system and individual cut-outs and master switches for each unit of equipment. It will thus be possible to keep accurate check on the amount of current consumed for cooking and baking. From former experience on board ship with this type of equipment it is expected that these records will show the maximum energy consumption not to exceed 3 kilowatt per hour per day per person fed, depending upon the type of service; this will probably be reduced at different times.

Let us review briefly a few of the advantages of electric equipment on board ship. In the first place there will be the elimination of the great hazards at sea, fire and breakdown. There will be excellent working conditions where formerly the ship's galley crew had to work under trying surroundings; there will be good ventilation as the air will not be filled with smoke, gas or fumes. Excessive heat is eliminated and the cool kitchen results. There is great convenience in operation, simply turning the switch and the heat is on. There is no replacing of refractory linings, for there is no overheating. There is no added danger due to rough weather. The temperatures are always even and constant. There is no back-blown soot and no variation in temperature affected by drafts.

One can imagine the comfort which a cooler galley will mean as the MALOLO will travel to tropical waters. The heat is generated only to the point of application and does not materially affect the air temperature in the galley. Furthermore, the oxygen in the room is not needed for combustion as in the case of flame fuels, leaving the air wholesome and fresh. The carrying of fuel and ashes is also done away with. There is also the saving on range tops which receive tremendous punishment when there is an application of flame fuels.

When the creation of the MALOLO was first conceived by the Matson Navigation Co. it was decided that this ship should be the equal of any passenger liner in the world. The responsibility for carrying out this ideal was entrusted to William Francis Gibbs, president of Gibbs Brothers, Inc., New York. She was built at the yard of Wm. Cramp & Sons. In every respect an earnest attempt has been made to provide the best possible equipment for all departments of the ship and it is to be hoped that she may have a long and successful career to justify the vision of her owners and the skill of her designers and builders.

Package Freight

As an indication of the apparent growth in the package freight business up and down the lakes, no less than seven vessels were unloading and loading general cargo at Buffalo Oct. 4. They were the JAFFRAY, CHICAGO, CONNERS, GORMAN, J. M. DAVIS, RALPH BUDD, and CROWLEY. Of these vessels one had sulphur for Cleveland and the others had merchandise for Detroit and upper lake ports.

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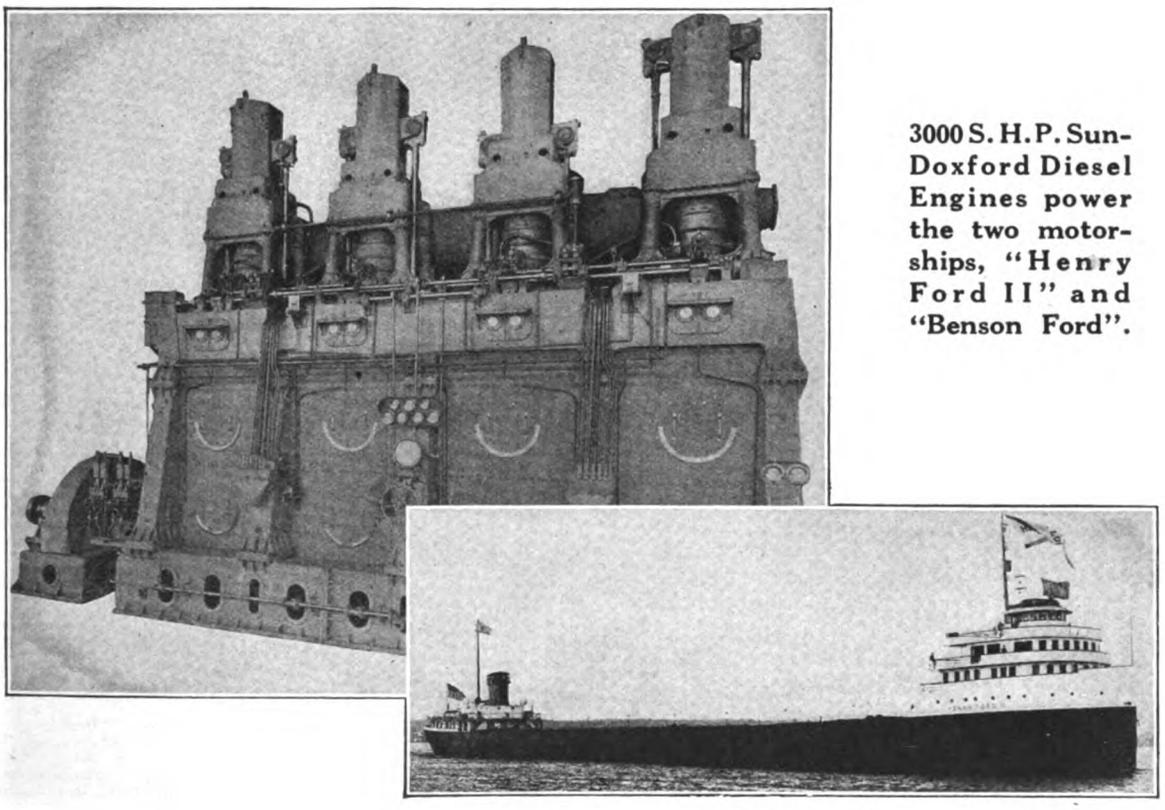
SUN SHIPBUILDING & DRY DOCK COMPANY

Builders of

SUN-DOXFORD DIESEL ENGINES

The Engines that Power

"HENRY FORD II" *and* "BENSON FORD"



3000 S. H. P. Sun-Doxford Diesel Engines power the two motorships, "Henry Ford II" and "Benson Ford".

M. S. "Henry Ford II"

SUN-DOXFORD *and* JUNKERS PATENTS

Main Office and Works:
Chester, Pa. - U. S. A.

Philadelphia Office:
Finance Building

New York Office:
Cunard Building

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Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	498	2,153,701	565	2,428,200
August	522	2,179,068	551	2,287,367
July	478	1,910,229	553	2,253,495
June	498	2,093,540	566	2,334,128
May	525	2,167,154	539	2,179,208
April	487	2,048,786	565	2,353,404
March	460	1,936,478	515	2,074,694
February	408	1,679,912	468	1,962,365
January	417	1,736,991	455	1,868,270
December, 1926	466	1,867,630	548	2,171,938

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	77	183,481	50	95,898
August	99	235,657	70	153,305
July	83	186,182	53	110,614
June	95	213,122	66	180,861
May	88	196,606	47	86,214
April	86	194,135	52	123,179
March	96	223,255	58	131,147
February	81	190,536	48	126,619
January	79	208,354	59	167,258
December, 1926	145	373,902	129	341,421

Boston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	114	375,509	83	243,244
August	149	441,819	96	285,255
July	147	401,008	103	326,695
June	155	344,548	99	242,957
May	130	318,196	100	262,982
April	120	343,388	72	201,868
March	95	301,413	59	187,556
February	83	277,063	40	119,246
January	88	266,147	51	159,241
December, 1926	97	286,013	52	170,314

Portland, Me.

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	32	68,688	32	61,227
August	33	61,873	32	58,949
July	37	62,890	35	55,144
June	24	31,714	25	34,855
May	24	38,244	22	37,246
April	21	37,182	21	37,114
March	23	63,195	27	73,944
February	23	65,826	21	59,178
January, 1926	25	59,155	26	66,791

Providence

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	4	12,240	4	14,109
August	5	27,235	1	4,035
July	11	37,384	5	17,628
June	3	12,559	5	15,930
May	9	36,882	6	25,950
April	7	28,776	5	18,903
March	7	26,065	7	25,780
February	3	10,380	6	23,696
January	3	9,632	6	20,091
December, 1926	5	17,666	5	19,074

Portland, Oreg.

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	59	211,182	79	291,920
August	32	117,116	47	157,715
July	31	110,966	35	119,824
June,	24	91,554	33	118,631
May	24	86,618	28	98,277
April	31	120,431	44	159,247
March	21	78,379	31	106,768
February	15	63,320	28	106,355
January	29	102,736	39	134,127
December, 1926	34	131,426	56	213,861

Baltimore

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	116	355,924	130	402,528
August	131	390,713	138	408,083
July	128	384,450	130	368,096
June,	125	375,204	125	376,019
May	112	333,395	117	340,274
April	131	409,145	127	377,039
March	120	355,162	117	323,893
February	100	308,501	95	301,401
January	117	362,553	126	361,277
December, 1926	245	722,141	269	783,058

Norfolk and Newport News

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	26	67,249	87	240,899
August	32	71,356	92	222,502
July	42	112,442	77	201,882
June	34	61,041	82	190,228
May	27	56,458	70	179,658
April	23	54,983	77	209,869
March	32	87,970	98	264,863
February	31	88,928	77	232,403
January	49	134,238	118	350,311
December, 1926	216	636,483	254	781,545

Savannah

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
August, 1927	30	90,063	30	93,030
July	33	96,525	30	87,055
June	27	67,095	30	75,193
May	37	103,549	37	102,757
April	30	87,296	26	108,150
March	37	102,732	39	114,871
February	41	106,385	40	101,633
January	29	34,029	32	91,974
December	38	107,763	36	104,445
November, 1926	40	97,689	33	102,822

Key West

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	69	86,793	72	88,480
August	72	81,247	70	84,132
July	78	84,790	79	84,186
June	84	97,585	85	97,535
May	105	113,030	106	115,564
April	78	79,818	74	75,913
March	80	91,602	75	93,700
February	90	101,179	84	102,571
January	89	116,112	89	119,191
December, 1926	92	113,985	87	104,448

Mobile

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	80	172,518	89	195,714
August	92	194,609	84	184,655
July	94	198,668	89	190,965
June,	97	206,410	84	165,649
May	114	287,650	103	205,876
April	107	240,278	108	218,246
March	107	217,848	98	197,395
February	99	249,158	86	199,907
January	96	224,819	88	191,752
December, 1926	82	164,129	82	174,618

Seattle

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	62	233,554	58	227,096
August	109	218,218	102	203,902
July	45	183,023	40	162,121
June	88	159,687	39	162,632
May	41	177,869	42	169,083
April	46	186,581	49	185,593
March	39	159,034	44	175,937
February	40	170,776	45	195,692
January	53	233,914	47	192,233
December, 1926	42	176,065	54	201,988

New Orleans

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	232	613,772	240	632,593
August	276	797,128	265	672,392
July	250	615,826	241	580,228
June	248	606,501	267	750,937
May	277	640,252	269	627,452
April	262	642,846	268	664,407
March	276	712,619	278	695,933
February	240	632,092	249	628,762
January	240	697,039	244	712,284
December, 1926	259	745,636	266	755,204

Charleston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	39	102,374	39	101,044
August	39	108,022	35	92,227
July	19	41,460	20	44,633
June	25	67,366	24	62,132
May	26	79,355	24	63,862
April	28	60,357	26	68,555
March	28	84,155	31	85,476
February	27	81,829	33	158,088
January	33	96,054	31	77,315
December, 1926	33	94,427	39	102,724

Galveston

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
February, 1927	43	114,628	82	248,364
January	47	146,318	97	318,609
December	56	147,040	103	302,474
November	64	180,917	118	359,948
October	47	112,816	118	352,202
September	52	139,219	127	368,302
August	55	129,477	131	389,432
July	60	164,241	116	352,290
June	53	119,497	72	185,444
May, 1926	28	65,578	61	180,449

Los Angeles

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	238	488,416	282	441,134
August	160	483,069	214	473,702
July	121	452,983	106	407,606
June	178	484,561	125	418,967
May	161	470,471	138	456,885
April	179	477,762	178	441,374
March	156	451,428	165	443,022
February	144	418,190	144	404,753
January	137	420,426	138	381,892
December	155	438,464	123	386,004
November, 1926	184	439,736	138	387,937

San Francisco

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	168	600,454	152	559,684
August	176	636,152	150	583,653
June	154	556,225	140	526,976
May	148	545,414	137	510,560
April	141	531,380	137	518,577
March	145	555,324	148	586,354
February	147	561,214	138	513,253
January	133	497,560	141	522,806
December	134	520,962	134	500,347
November, 1926	128	543,103	139	512,671

Port Arthur

(Exclusive of Domestic)

Month	Entrances — No. ships	Entrances — Net tonnage	Clearances — No. ships	Clearances — Net tonnage
September, 1927	16	51,492	29	83,728
August	22	58,352	27	78,652
July	21	61,871	34	102,998
June	16	44,565	26	92,198
May	15	46,223	28	83,926
April	26	57,645	40	107,767
March	20	47,789	23	58,863
February	34	80,068	31	84,824
January	22	57,644	28	84,531
December	25	72,885	31	100,184
November, 1926	25	67,298	31	96,171

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